FURUNO

OPERATOR'S MANUAL

COLOR GPS PLOTTER GP-188
COLOR VIDEO PLOTTER GD-188

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⚠ SAFETY INSTRUCTIONS

"**DANGER**", "**WARNING**" and "**CAUTION**" notices appear throughout this manual. It is the responsibility of the operator and installer of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.

⚠ **DANGER**	This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**	This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.

⚠ SAFETY INFORMATION FOR THE OPERATOR

⚠ WARNING



Do not open the cover of the equipment.

This equipment uses high voltage electricity which can shock, burn or cause death. Only qualified personnel should work inside the equipment.

Do not dissasemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the ship's mains switchboard if water or foreign object falls into the equipment or the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire, electrical shock or serious injury.

WARNING Label attached

⚠ WARNING ⚠

To avoid electrical shock, do not remove cover. No user-serviceable parts inside.

Name : Warning Label (1)
Type : 86-003-1011-0
Code No. : 100-236-230

⚠ CAUTION

Do not place liquid-filled containers on the top of the equipment.

Fire or electrical shock can result if a liquid spills into the equipmtnt.

Do not place heater neat the equipment.

Heat can melt the power cord, which can result in fire or electrical shock.

Do not operate the unit with wet hands.

Electrical shock can result.

Use the correct fuse.

Use of the wrong fuse can cause fire or equipment damage.

No single navigation aid (including this unit should ever be relied upon as the exclusive means for navigating your vessel.

The navigator is responsible for checking all aids available to confirm his position. Electronic aids are interded to assist, not replace, the navigator.

Use of an autopilot with this unit, to provide automatic steering to destination, does not eliminate the need to maintain a watch.

Always maintains a vigilant watch to prevent collision or grounding.

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Introduction

FURUNO Electric Company thanks you for considering and purchasing the FURUNO GD-188/GP-188. We are confident you will discover why FURUNO has become synonymous with quality and reliability.

For over 40 years FURUNO Electric Company has enjoyed an enviable reputation for efficient and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Your unit is designed and manufactured to meet the rigorous demands of the marine environment. However, no machine can perform to the utmost of its ability unless properly operated and maintained. Please carefully read and follow the recommended procedures for operation and maintenance.

We would appreciate hearing from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO.

Features

The GD-188 and the GP-188 mostly share the same features. The GP-188 additionally has a GPS receiver and a GPS antenna, to receive and process GPS satellite signals.

Navigation data appear on a high-resolution, 12 inch CRT.

On-screen data include ship's position in latitude and longitude, speed and course, cursor position, range and bearing to cursor, and range and bearing to waypoint.

Features common to both the GD-188 and the GP-188 are

- Alarms: Arrival alarm, Anchor Watch alarm, Cross-track Error alarm, Border alarm, Ship's speed alarm, Wake-up alarm, etc.
- Built-in memory – 13,000 points of tracks, marks, lines and comments, 198 waypoints, 10 routes with up to 10 waypoints per route
- Optional RAM DISK kits increase memory capacity to 200,000 points
- Comprehensive navigation display of alphanumeric navigation data plus automatic track plotting
- Factory-digitized electronic charts stored on ROM cards
- Floppy disk drive for storage of data on floppy disks
- Menu-driven operation
- Navigation planning from/to waypoint or routes

How to Use this Manual

This manual is laid out in as "user-friendly" a manner as possible. A sophisticated instrument such as the GD-188 and the GP-188 with their many, many functions can be very intimidating to the first-time user. It is our intention to guide the user along in the use of the gear as gently and as comfortably as possible in a series of sections that start a very basic level and proceed forward in complexity in a logical manner.

This manual consists of the following chapters and sections:

Operational Overview. This chapter introduces you to your unit and includes a tutorial to get you started in operation.

Track. This chapter teaches you the functions concerned with ship's track. How to change track color, stop recording track, and change track appearance are some of the subjects presented here.

Marks. Marks can be electrically inscribed on the display to depict important points. This chapter teaches you how to enter, delete and change the color of marks.

Lines. This chapter describes how to enter and delete lines.

Waypoints and Routes. This chapter tells you how to enter waypoints and routes and use them for navigation.

Alarms. You will learn how to set the various alarms in this chapter.

Recording and Replaying Data. This chapter mostly covers how to record and replay data. Other subjects include how to delete and copy files on a memory card or floppy disk.

Customizing Your Unit. This chapter discusses the features of your unit which you can customize to your liking.

Maintenance and Troubleshooting. You will learn how to keep your unit in good working order in this chapter.

GPS Receiver Operation (GP-188). This chapter contains information about GPS, and how to operate the GPS receiver.

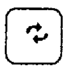
Appendix. The appendix contains the specifications of both the GD-188 and the GP-188, control description, menu tree, time differences chart, Loran C chains list, Loran A chains list, Decca chains list, and waypoint log.

Index. To help you find what you are looking for.

Typographic Conventions

Before you start reading this manual, please familiarize yourself with the typographic conventions we use throughout this manual.

- For sake of brevity, we use the term "188" when referring to both the GD-188 and the GP-188.
- Key names appear in a font different from the body text for emphasis. For example, the MENU key appears as **MENU** key.
- The 188 has several varieties of cursors: cross hair cursor, circle cursor and parallel cursor. Unless otherwise noted, the term "cursor" refers to the cross hair cursor.
- Several keys are labelled with a symbol rather than a name or abbreviation. In this instance we substitute a name for the symbol. Below is a list of these keys. Note that these names also appear on the menu.

Key	Appears in text and menu as;
	**Scale** keys
[↑], [↓], [←], [→]	**Arrow** keys
	**CHG** key

OPERATIONAL OVERVIEW

This chapter provides an overview of the 188, including a tutorial which introduces its basic functions.

Among the topics presented in this chapter are how to

- display an electronic chart
- shift the cursor
- shift the picture
- enter a mark
- enter a line
- enter a waypoint
- set a destination waypoint, and
- read the various displays.

The System

System configuration

The basic system consists of a display unit and a remote control unit. The GP-188 additionally has a GPS antenna unit and a GPS receiver.

Display unit

The display unit consists of a keyboard, floppy disk drive, memory card drive, and a CRT (display screen).

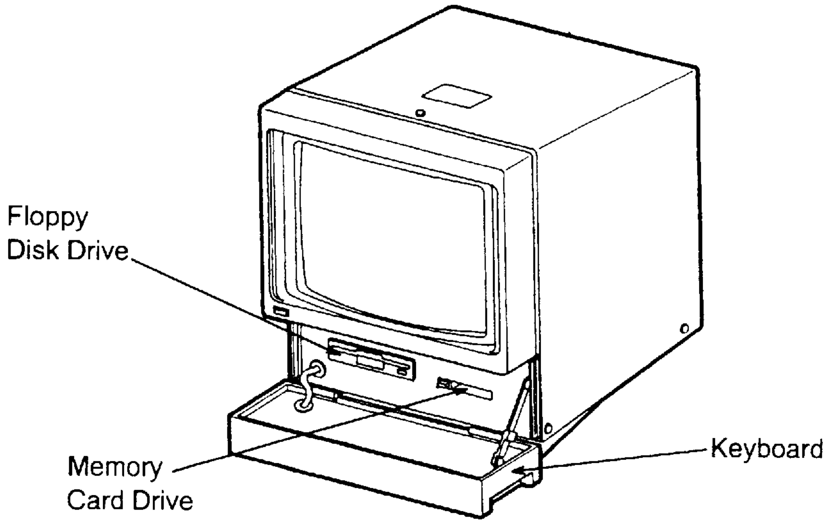


Figure 1-1 Display unit

Keyboard

Color-coded keys

The keyboard has 52 color-coded keys.

- Brown keys: These keys function to execute the most commonly used features such as mark and waypoint entry.
- Black keys: These keys mostly enter numeric data.
- Blue keys: These keys have a wide range of functions from registering data to changing the chart scale.

For a complete description of controls, see the Appendix.

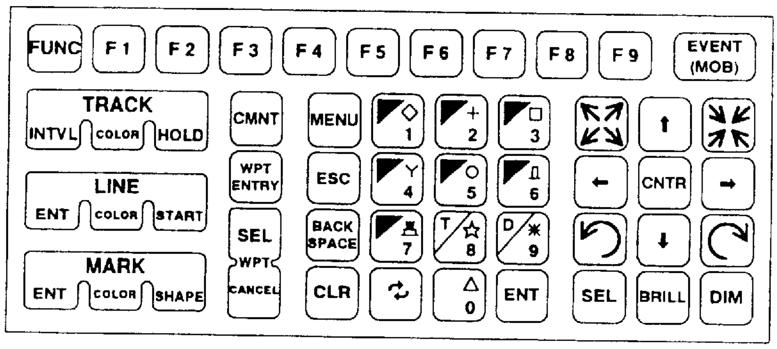


Figure 1-2 Keyboard

Keyboard response

Each time you enter a command correctly the 188 releases a beep to confirm acceptance of your command. It releases several beeps in case of invalid input.

Data entry rules

The entry of leading zeroes is mandatory; trailing zeroes are optional. For example, to enter waypoint 7, press **0** and **7**.

Floppy disk drive and floppy disks

The floppy disk drive reads and writes floppy disks. It uses standard 3.5 inch floppy disks, type 2DD. Regular cleaning of the drive prevents loss of information stored on floppy disks by dirty drive head. For how to clean the drive, see Table 9-1 on page 9-2.

Care and handling of floppy disks

- Keep away from direct sunlight and heat sources.
- Do not touch the magnetic disk inside.
- Do not touch the center hub.
- Store where the temperature and humidity are stable.
- Keep away from dust, oil and foodstuffs.
- Do not place things on floppy disks.
- Keep away from magnets.
- Remove floppy disk from the floppy disk drive before turning off the power.
- Replace floppy disk in its case after use.
- Floppy disks are not a fail safe recording device. You should record all important information in a log.
- The floppy disk has a write-protect tab to prevent writing over information stored on the disk. Slide the tab to open the "hole" in the disk to write-protect information.

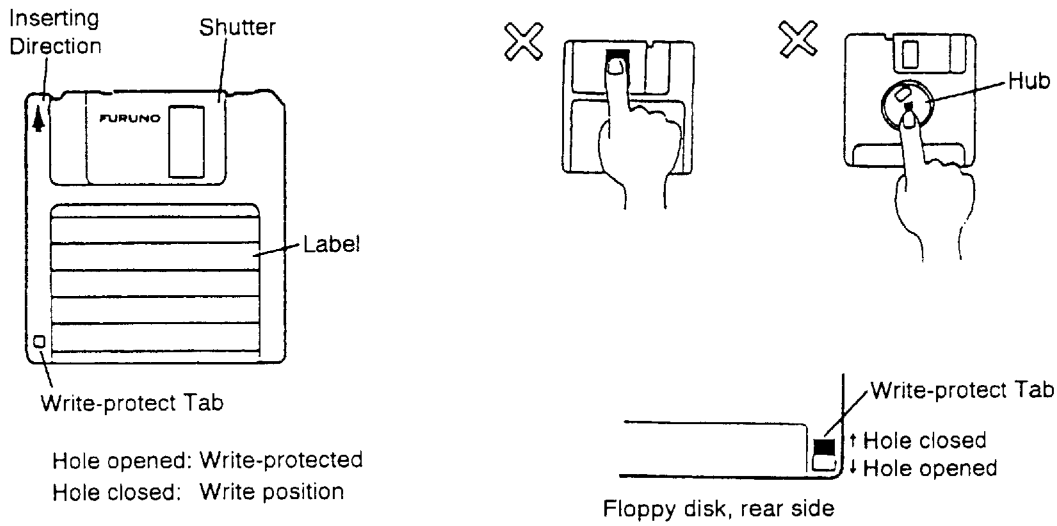


Figure 1-3 Care and handling of the floppy disk

Memory card drive and memory cards

The memory card drive reads ROM cards (electronic charts) and writes and reads RAM cards.

Care and handling of memory cards

- Do not drop, bend or exert pressure on the cards.
- Keep away from water.
- Do not disassemble the card.
- Keep the connector free of foreign material.
- Keep cards out of direct sunlight and away from heat sources.
- Store the RAM cards where the temperature and humidity are stable. High temperature and humidity drain the battery on the RAM card. (The battery of the 512K RAM card lasts four years in temperature of 25 degrees Centigrade; three years in temperature of 40 degrees Centigrade.)
- Static electricity can erase information stored on a memory card. Replace the memory cards in their protective cases (or anti-static vinyl bag, aluminum foil) after use.
- Pay special attention to card direction when inserting the card in the drive.
- The RAM card lasts about five years. Write on the card the date when the card is first used. Copy necessary data to a new card well before the expected expiration date of the card.

Cleaning the memory card

Cleaning the memory card with an ordinary paper towel or cloth can create static electricity on the card surface, which can erase information stored on the card. The surface of the card can be cleaned by gently wiping it with lint-free paper or gauze, moistened with ethanol (or methanol) alcohol if desired. Be sure the alcohol does not contact the connectors.

The remote control unit

The remote control unit provides armchair operation of the display unit from up to five meters away. It is powered by two AAA batteries. Install the batteries as shown in Figure 1-4. To operate the 188 by the remote control unit, point the remote control unit toward the optical sensor on the display unit and operate its keys. When the battery voltage is low the distance from which the display unit can be controlled decreases.

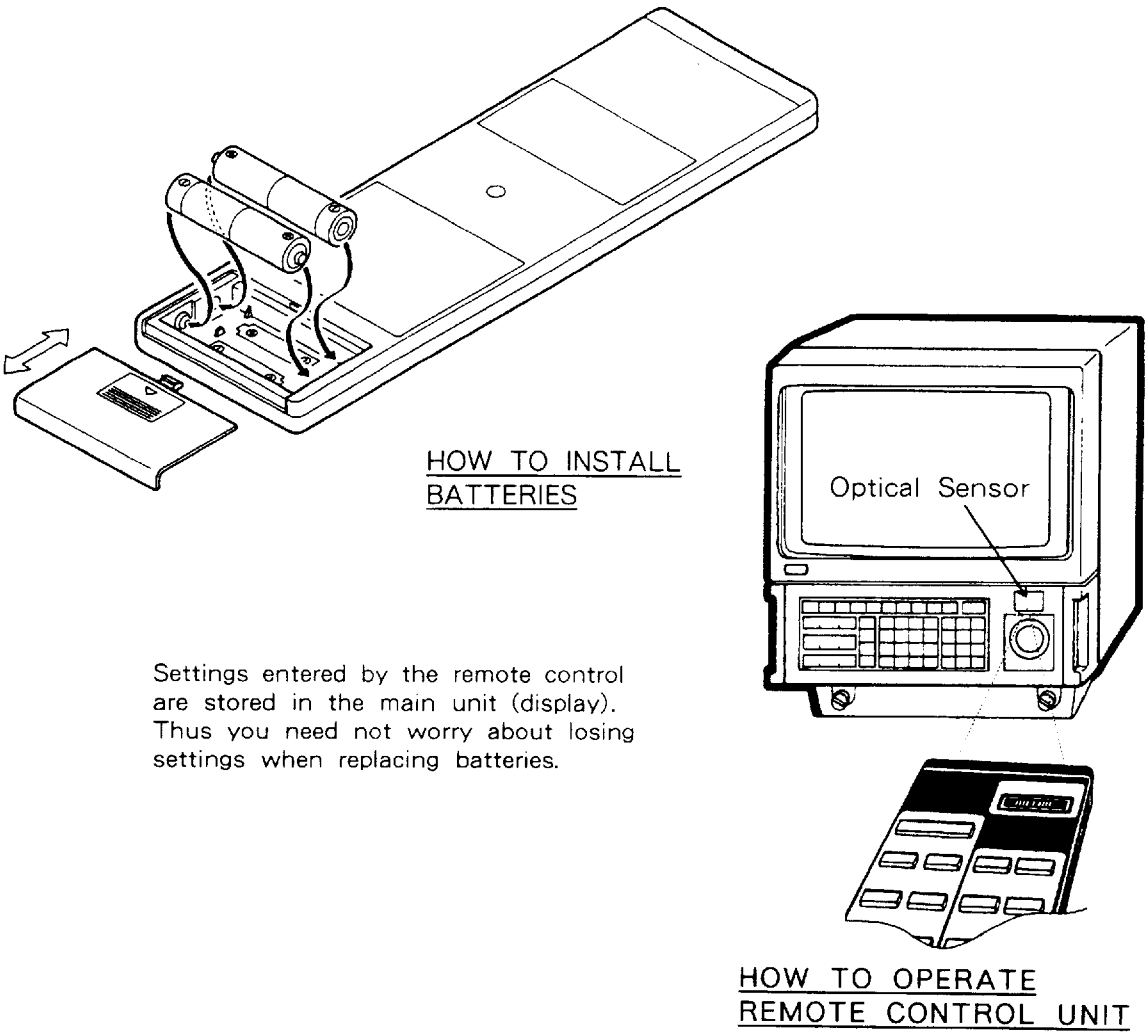


Figure 1-4 How to operate the remote control unit

For detailed operating information see the operator's manual of the remote control unit.

■ **NOTE 1:** *Do not operate the remote control unit with wet hands. Water can leak inside the unit, damaging it and voiding the warranty.*

■ **NOTE 2:** *The remote control unit can be operated while it is stored in its protective case.*

Tutorial

Introduction

This tutorial teaches you how to execute a few of the basic functions of this unit. Among the topics presented are how to turn on the power and set a destination waypoint. If your unit is installed, try to operate the keys as you review this section.

Inserting a chart card

The chart card (ROM card) contains an electronic chart. Insert it into the memory card drive as follows.

1) Open the keyboard panel.
2) Insert the chart card in the memory card drive as shown in Figure 1-5.

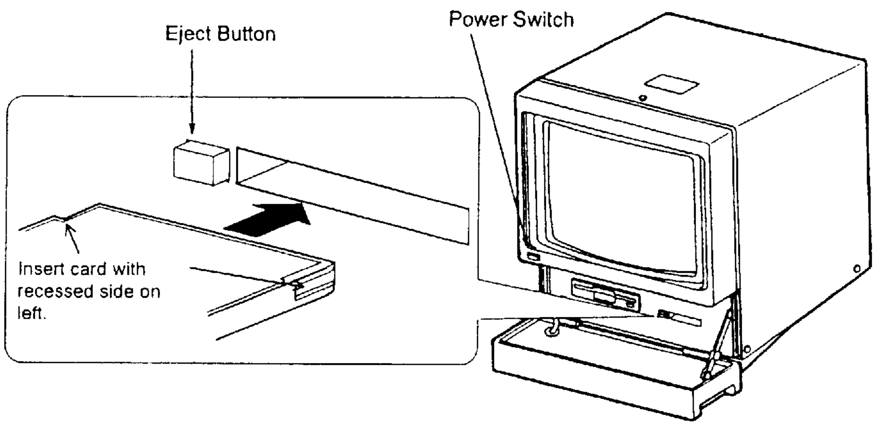


Figure 1-5 Display unit, keyboard panel opened

■ **NOTE:** *You can automatically display a chart when turning on the power by inserting the chart card before turning on the power.*

Ejecting a chart card

Press the eject button to the left of the memory card drive.

Turning the power on and off

Press the **POWER** switch. When turning on the power the display changes in the sequence shown in Figure 1-6.

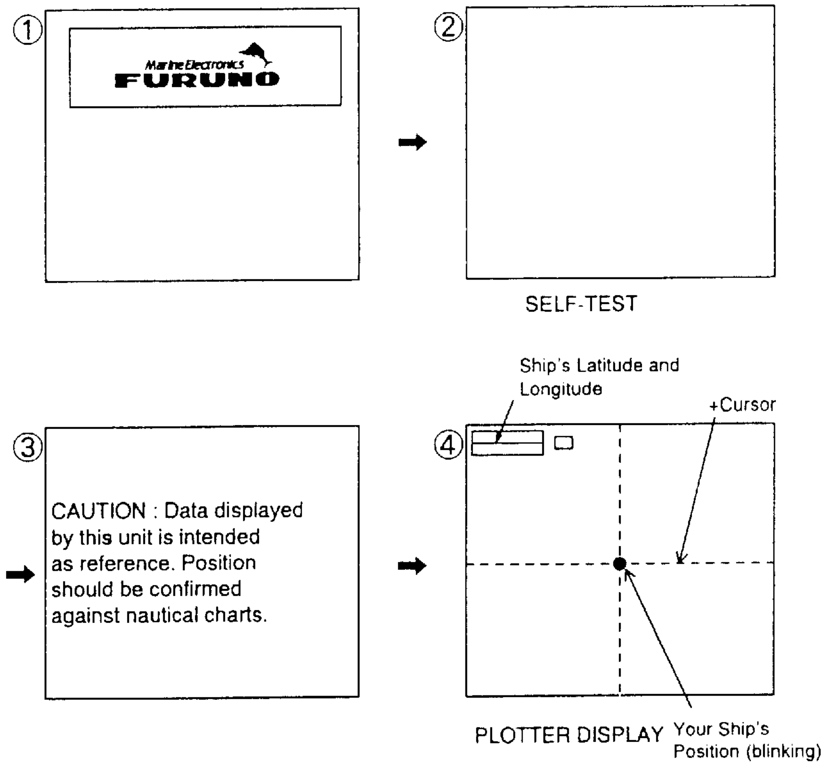


Figure 1-6 How the display changes when turning on the power

For the GP-188

After turning on the power the own ship mark, which denotes ship's position, blinks every 0.5 seconds. This means the position displayed is not reliable. On the initial power application after installation it takes about 15 to 45 minutes for the GPS receiver to fix its position. Other times it takes about 45 seconds. When position data is reliable the own ship mark blinks every second.

For the GD-188

The own ship mark blinks every second when position data fed from the external navigator is reliable.

Self-test

Each time you turn on the power the 188 performs a simple self-test to check itself for proper operation. If equipment fault is found the 188 continuously shows the self-test display. In this case press any key to try to restore normal operation. If that doesn't work, refer to the troubleshooting section in Chapter 9.

Changing chart scale

The chart scale can be changed with the **Scale** keys. The arrows on the keys indicate which direction the chart scale may be changed. Note that a larger range in essence shrinks the picture, and a smaller range "blows up" the picture. With a smaller range, you may find that the track appears in tiers. If the chart is overenlarged its land areas are not filled; they are hollow.

The current chart scale appears at the top right-hand corner of the display.

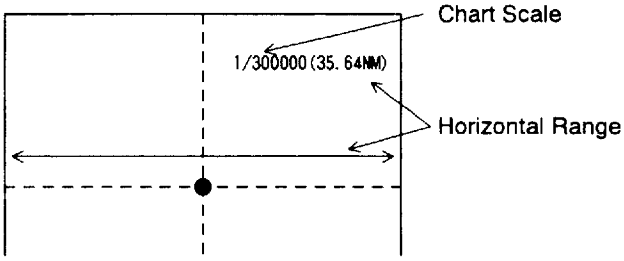


Figure 1-7 Location of chart scale indications

Shifting the display

To shift the display;

1) Press the **CHG** key to turn off the cursor.
2) Operate the trackball. The display follows the movement of the trackball. Note that the display can also be shifted with the **Arrow** keys ([↑], [↓], [←], [→]).
3) Press **CNTR** to return the own ship mark to the screen center.

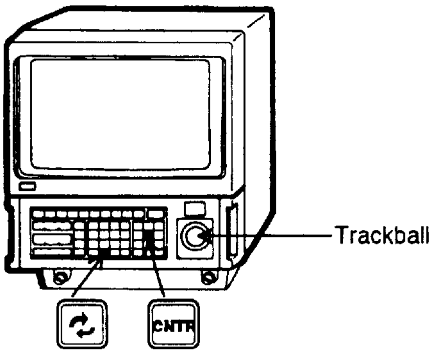


Figure 1-8 Display unit, showing location of the **CNTR** *key*

Shifting the cursor

This unit has several types of cursors. The one you will use most often is the cross hair cursor.

1) Press the **CHG** key to turn on the cursor.
2) Operate the trackball. The cursor follows the movement of the trackball.

Note that the cursor can also be shifted by the **Arrow** keys; they are useful for fine tuning placement of the cursor.

The latitude and longitude of the cursor intersection appear at the top left-hand corner of the display.

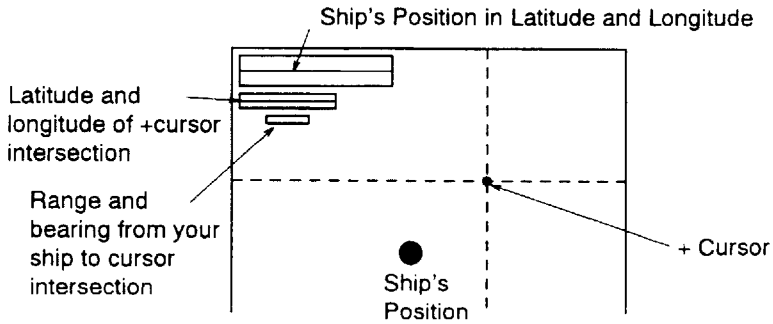


Figure 1-9 Location of cursor position information

Adjusting display brilliance and keyboard backlighting

Brilliance: Press **BRILL** to adjust display brilliance. Eight levels of brilliance (including off) are available.

Backlighting: Press **DIM** to adjust keyboard backlighting. Four levels (including off) are available. Note that this key does not emit the keyboard response tone when pressed.

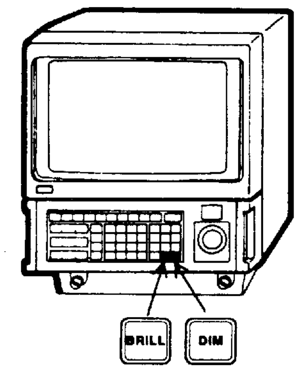


Figure 1-10 Display unit, showing location of **BRILL** *and* **DIM** *keys*

Changing track color

Follow the procedure below to change track color. You will use the keys called out in Figure 1-11.

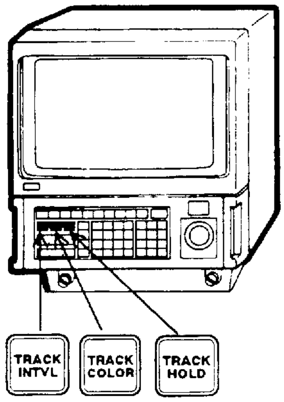


Figure 1-11 Display unit, showing location of "TRACK" keys

1) Press the **CHG** key to turn off the cursor, and then press the **Scale** keys to select highest chart scale. (Note that the ship's trackline appears even if own ship is moored, because of signal variation.)

2) Press **TRACK COLOR** and **1**. At the bottom of the menu the colors available for track color appear.

Color?:		5	PPL
1	RED	6	BLU
2	YEL	7	WHT
3	GRN	8	By Temp
4	CYN	9	By Depth

Figure 1-12 Track color menu

3) Press a number key among 1 through 7.

Suspending/resuming recording of track

Suspending

Press **TRACK HOLD**. The own ship mark now appears as a hollow circle. The track is neither displayed nor recorded from that moment.

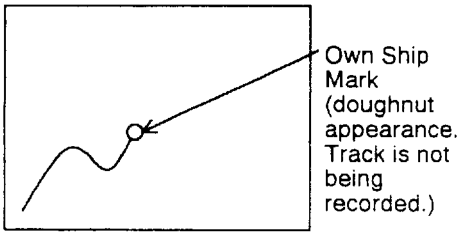


Figure 1-13 Own ship mark appearance when track is not being recorded

Resuming

Press **TRACK HOLD**. The own ship mark changes to a filled circle. The track is both displayed and recorded from that moment.

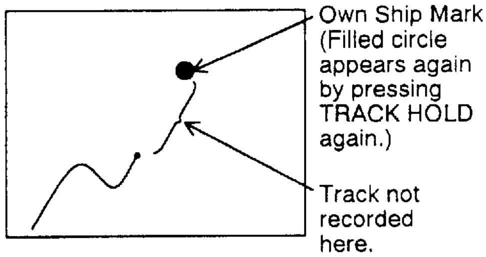


Figure 1-14 Appearance of track and own ship mark when recording of the track is resumed

Changing track plotting interval

The default plotting interval is 0.01 nautical miles. If you want to change the plotting interval to one minute, for example;

1) Press **TRACK INTVL**. Your display should look something like Figure 1-15.

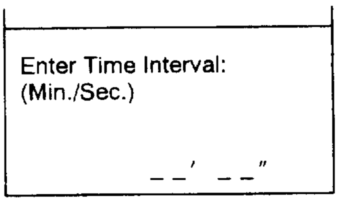


Figure 1-15 Plotting interval entry display

2) Enter plotting interval. If it is one minute, for example, press **0**, **1**, **0**, **0** and **ENT**.

How the track is drawn

In drawing the track, first the ship's position fed from the navigation aid is stored into this unit's memory at an interval of time or distance selected by the operator. A shorter interval provides better reconstruction of the track, but total storage time of the track is reduced.

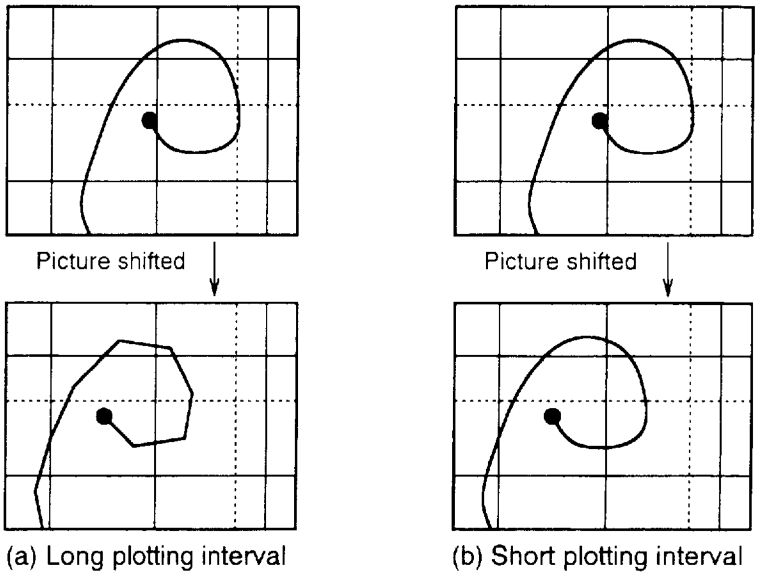


Figure 1-16 Track reconstruction and track plotting interval

When the track memory is full...

This unit cannot record the track indefinitely. When the track memory is full the oldest track is erased to make room for the latest.

Processing marks

Marks can be electrically inscribed on the display to depict important data. This section shows you how to

- enter marks
- change the color and shape of marks
- erase marks, and
- enter mark at ship's position.

You will use the keys called out in Figure 1-17.

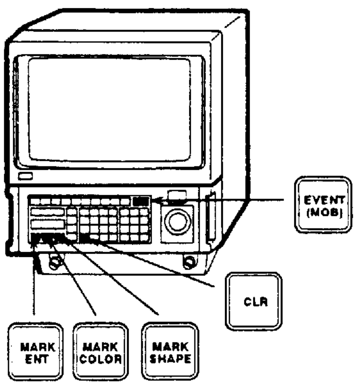


Figure 1-17 Display unit, showing keys used to enter/erase a mark

Entering a mark

1) Operate the trackball to set the cursor on location desired for mark. (If the cursor is off, press the **CHG** key to display it.)

2) Press **MARK ENT**. In the default setting a purple diamond is inscribed on the display.

Changing mark color

The procedure which follows shows how to change mark color. It does not change the color of previously entered marks.

1) Press **MARK COLOR**. Your display should show the mark color menu.

```
Enter Number:
1  RED    5  PPL
2  YEL    6  BLU
3  GRN    7  WHT
4  CYN
```

Figure 1-18 Mark color menu

2) Press appropriate number key to select color.
3) Enter a mark as prescribed earlier, and it will be painted in the color selected here.

Changing mark shape

The procedure which follows shows how to change mark shape. It does not change the shape of previously entered marks.

1) Press **MARK SHAPE**. Your display should show the mark shape menu.

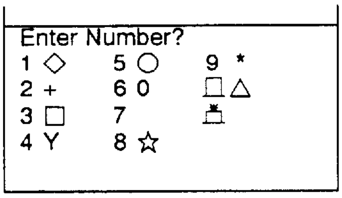


Figure 1-19 Mark shape menu

2) Press appropriate numeral key to select shape.

Erasing a mark

Operate the trackball to place the cursor intersection on mark and then press **CLR**.

Entering mark at ship's position

Press **EVENT (MOB)**.

Processing lines

In this section you will learn how to enter and delete lines. Lines are useful for denoting danger areas, etc. on the display. Further, you can construct your own nautical charts using lines.

Entering a line

Follow the procedure below to inscribe a line in two colors by using the cursor. You will use the keys called out in Figure 1-20.

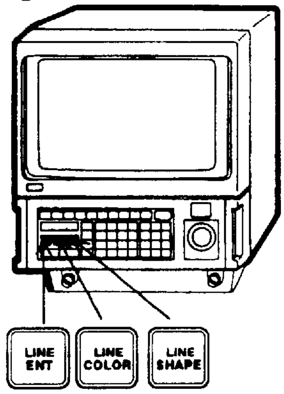


Figure 1-20 Display unit, showing keys used to draw a line

1) Press the **CHG** key to display the cursor if it is not already displayed.
2) Operate the trackball to select starting point of line by the cursor.
3) Press **LINE START**.
4) Operate the trackball to set the cursor on the next point of the line.
5) Press **LINE ENT**. A solid green line (default line color) connects the two points.

Changing line color

1) Press **LINE COLOR**.

Enter Number:

1	RED	5	PPL
2	YEL	6	BLU
3	GRN	7	WHT
4	CYN		

Figure 1-21 Line color menu

2) Select a color by pressing appropriate numeral key. For example, press **1** to color the line red.
3) Select another point for the line by operating the trackball and pressing **LINE ENT**.

The line segment is colored in red.

Erasing a line

Place cursor intersection on either end of the line you want to erase and then press **CLR**.

Lines are dealt with in further detail in Chapter 4.

Attaching a comment to a mark or line

You can attach a comment to marks and lines on the display. A comment may contain up to 12 alphanumeric characters. The unit stores comments, as well as line position and mark position, in the comment list.

1) Press **CMNT**.
2) Operate the trackball to set the cursor intersection on the line or mark to which you want to attach a comment.
3) Press **ENT**. Your display should show a screen of upper case letters as shown in Figure 1-22. You can also use lower case letters in your comment. The **CHG** key serves to switch between upper and lower case letter sets.

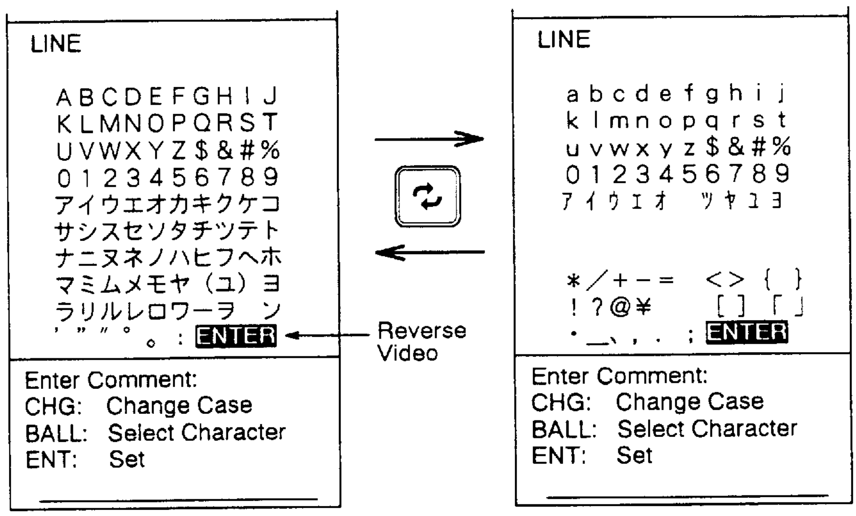


Figure 1-22 Characters available for comment

4) Operate the trackball to select the first character of the comment. Currently selected character appears in reverse video. Numbers can be entered by selecting them on the menu, or entering through the keyboard.
5) Press **ENT**. The character selected appears at the bottom of the menu.
6) Repeat steps 4 and 5 to complete the comment.
7) Operate the trackball to select "ENTER".
8) Press **ENT**. Your comment appears on the display.

■ **NOTE 1:** *All comments on the display can be erased or re-displayed by the following key inputs:*

erase all comments: [MENU] [9] [1] [2] [1] [1] [1]

re-display all comments: [MENU] [9] [1] [2] [1] [1] [2]

■ **NOTE 2:** *You can automatically enter a comment for a mark or line along with next consecutive number by skipping steps 4, 5, 6 and 7 in the previous procedure. For example, the last-entered comment is "CRABTRAP1". Then, to automatically attach the comment "CRABTRAP2" to the next mark or line you enter, you would do steps 1, 2, 3, and 8, after entering the mark.*

■ **NOTE 3:** *You can also attach a comment to target point marks, waypoints and externally generated marks (event, fish, etc.), by following the procedure below.*

1) *Operate the trackball to set the cursor on the item you want to attach a comment to.*
2) *Press* **LINE START**. *A mark appears at the cursor intersection.*
3) *Press* **CMNT**.
4) *Follow instructions on previous page.*

Entering a waypoint

This section shows you how to register a waypoint by entering latitude and longitude coordinates, the default waypoint entry method.

1) Press **WPT ENTRY**.

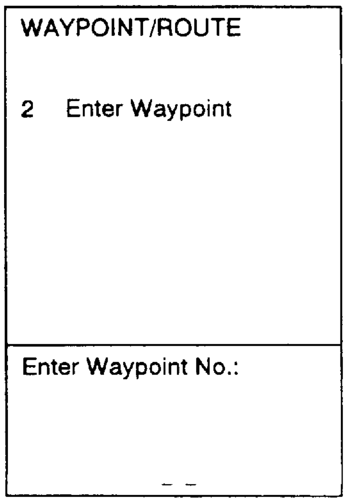


Figure 1-23 WAYPOINT/ROUTE menu, enter waypoint

2) Enter waypoint number. To enter waypoint number 07, for example, press **0**, **7** and **ENT**.

3) Enter latitude of waypoint. For example, enter 34°44.125 minutes North latitude.

[3] [4] [4] [4]

[1] [2] [5] ([CHG]) [ENT]

(Press **CHG** *for South latitude.)*

4) Enter longitude of waypoint. For example, 135°21.345 East longitude.

[1] [3] [5] [2] [1]

[3] [4] [5] ([CHG]) [ENT]

(Press **CHG** *for East longitude.)*

5) Your display should show a screen of upper case letters as shown in Figure 1-24. You can also use lower case letters in your comment. The **CHG** key serves to switch between upper and lower case letter sets.

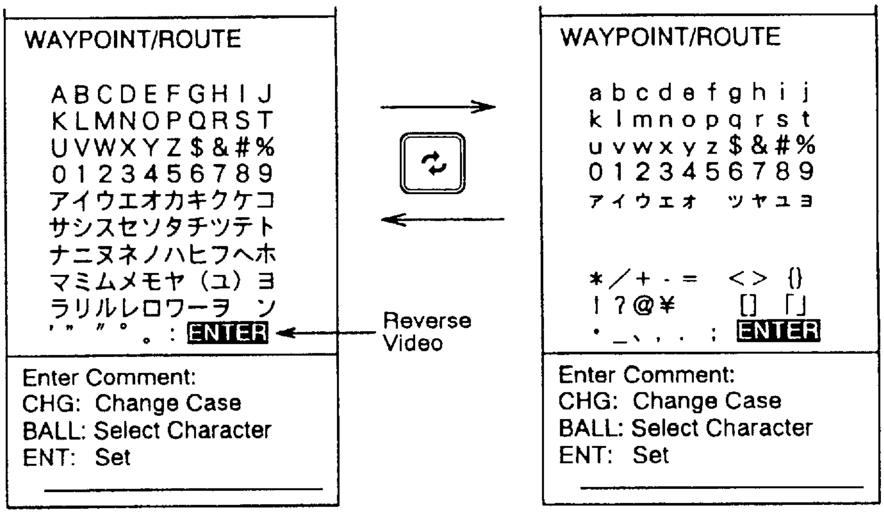


Figure 1-24 Characters available for comment

6) Operate the trackball to select the first character of the comment you want to enter. Currently selected character appears in reverse video.

7) Press **ENT**. The character selected appears at the bottom of the menu.

8) Repeat steps 6 and 7 to complete the comment.

9) Operate the trackball to select "ENTER".

10) Press **ENT**.

11) Press **MENU** twice to escape. A yellow octagon with waypoint number inside it marks a waypoint on the display.

Waypoints are discussed in detail in Chapter 5.

Setting/cancelling a destination waypoint

A destination waypoint is a single waypoint from which you want to proceed from present position. When you set a destination waypoint the unit computes range and bearing from a position to the waypoint and shows ideal course.

Setting

To set a destination waypoint;

1) Press **SEL WPT**.
2) Enter waypoint number. If you entered waypoint 07 in the previous section, press **0**, **7** and **ENT** to set it.

Your ship's position is marked as waypoint "00" and a light-blue line connects it with waypoint 07. This line shows the shortest range and course to the destination waypoint. The latitude and longitude of the destination waypoint and the range and bearing from your ship to it appear at the top right-hand corner of the display.

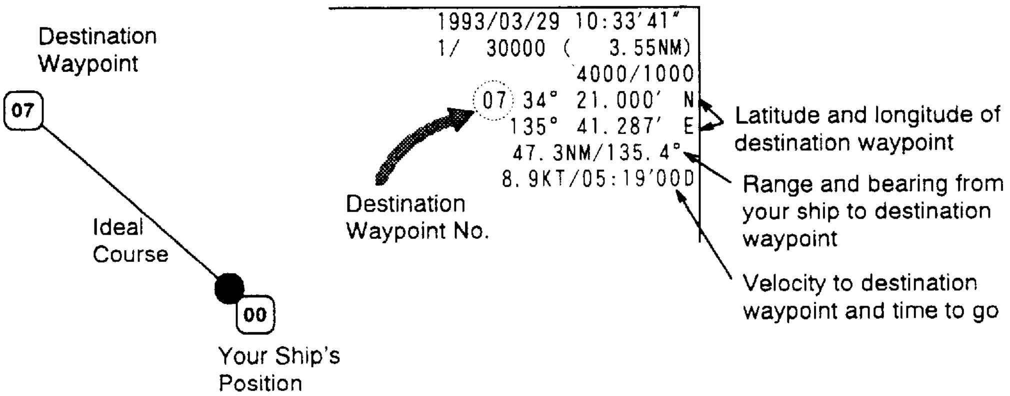


Figure 1-25 Appearance of destination waypoint on the display and location of destination waypoint information

Cancelling

Press **CANCEL WPT**.

Function Keys

What are the function keys?

The function keys, labelled F1 through F9 at top of the keyboard, work similar to the automatic dialing feature on a telephone, recording keystrokes and playing them back exactly as they were pressed. Each function key has a main function and a sub function. You can execute the sub function by pressing **FUNC** followed by function key.

The default function key settings are as outlined in Table 1-1.

Table 1-1 Default function key programs

Key	Label	Default Setting
F1	INTVL 1	Plotting interval of 0.01 nautical miles.
F2	INTVL 2	Plotting interval of 0.1 nautical miles.
F3	CMNT LST	Display comment list.
F4	WPT LST	Display waypoint list.
F5	FD RCD	Record track to floppy disk at preset interval.
F6	FD RPLY	Replay floppy disk.
F7	FILL BRT	Fill land on chart in high brightness.
F8	FILL DIM	Fill land on chart in low brightness.
F9	FILL OFF	Hollow land on chart.
FUNC F1	CU/NU/WU	Select display orientation.
FUNC F2	T/D GRPH	Turn water temperature and water depth graph on or off.
FUNC F3	NAME OFF	Turn geographical names on chart on or off.
FUNC F4	DUAL TRK	Turn sub track display on or off.
FUNC F5	L/L	Display position in latitude and longitude.
FUNC F6	TD	Display position in Loran C LOPs.
FUNC F7	LOP	Display position in Decca LOPs.
FUNC F8	TRK OFF	Erase track by cursor.
FUNC F9	LINE OFF	Erase line by cursor.

In Chapter 8 you will learn how to program the functions keys to your liking.

How to Read the Plotter Display

Your ship's position

Your ship's position is shown on the display as a blinking, filled circle, called the own ship mark.

For the GP-188, the own ship mark blinks quickly when turning on the power and blinks slowly once the GPS receiver fixes its position. "2D" appears on the display when the GPS receiver has fixed its position. It takes about 45 minutes to fix position at the initial power application and about 45 seconds at normal power on.

For the GD-188, the own ship mark blinks slowly when position data fed from the external navigator is reliable, and quickly when it is not.

GPS-related indications (GP-188)

Table 1-2 GPS-related indications on the plotter display

Indication	Meaning
CST	COLD START. Manually starting up the GPS receiver.
ACQ	ACQUIRE. The GPS receiver is acquiring a satellite to fix its position.
2D	Two-dimensional position fixing (for marine vessels).
IMP	IMPOSSIBLE. Impossible to receive GPS satellite signal.
INT	INTERRUPT. The GPS receiver cannot receive GPS satellite signal because it is interrupted by mast, etc. near GPS antenna.
3D	Three-dimensional position fixing.
ALM	ALMANAC. Receiving the almanac.

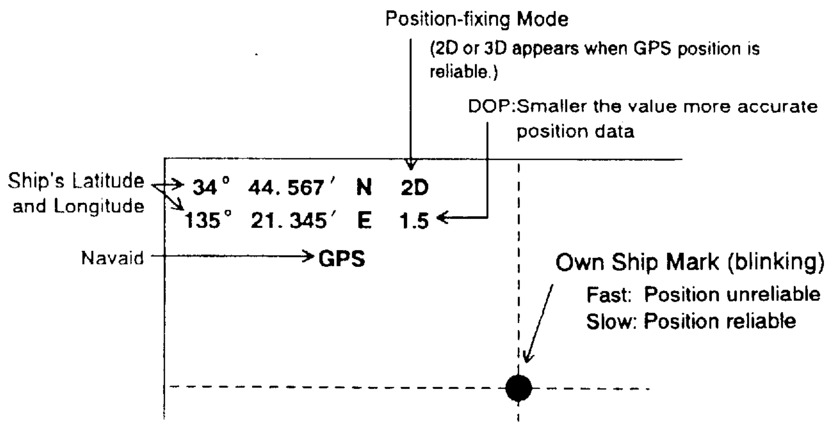


Figure 1-26 Location of GPS-related indications on the plotter display

Indications common to both GD-188 and GP-188

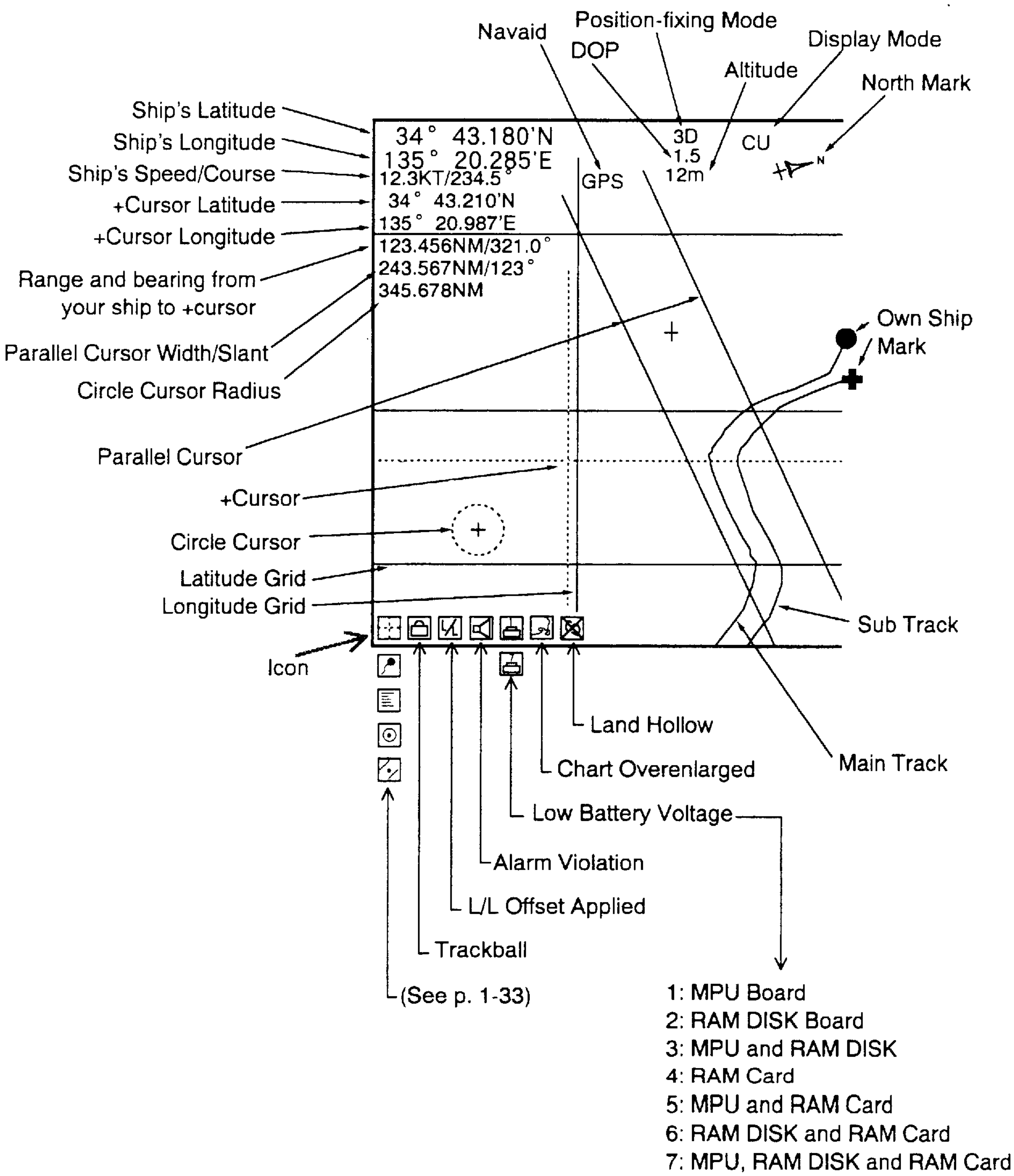


Figure 1-27(a) Plotter display indications

(continued)

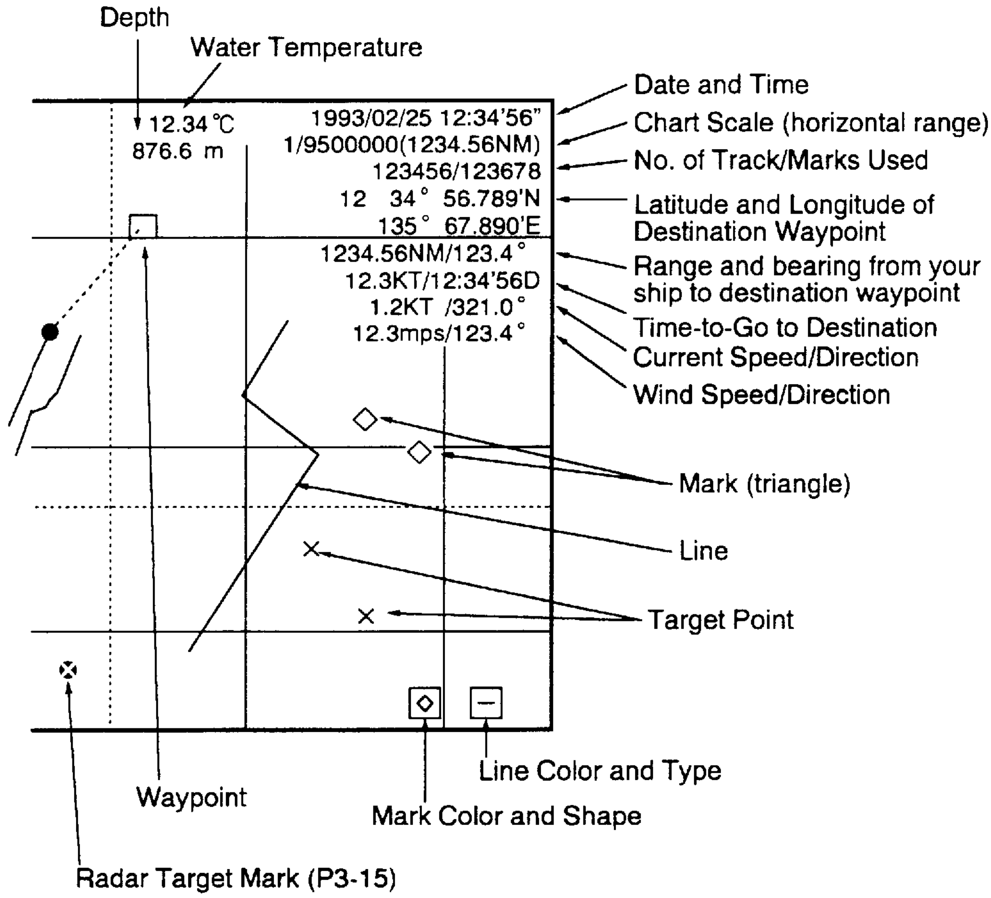


Figure 1-27(b) Plotter display indications

Electronic Chart Cards (ROM cards)

Displaying a chart

The electronic chart card contains a factory-digitized chart. You can order chart cards through any authorized FURUNO dealer.

■ **NOTE:** *Chart cards are intended for reference only. The prudent navigator always confirms his position against other aids to navigation.*

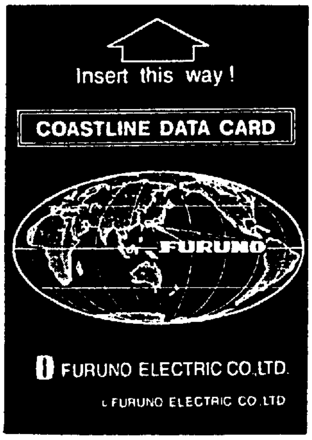


Figure 1-28 Electronic chart card

At power on

Insert chart card in the memory card drive and then turn on the power.

While the unit is on

Insert chart card in the memory card drive and then press the **Scale** keys to display the chart.

Types of chart cards

The chart cards can be generally classified in two types: general and detailed. For example, a general card could be one showing the shoreline of California, and a detailed card could be one showing San Francisco Bay. Therefore, if you are displaying the shoreline of California, don't expect much detailed information on San Francisco Bay.

On enlarging a chart

Figure 1-29 shows an electronic chart of the Ise Peninsula/Tokai (eastern sea) area of Japan. All charts can display indices, shown by green-colored rectangles, which circumscribe areas on the chart which you may enlarge without losing detail. (These indices may be turned on or off. More on this later.) In Figure 1-30, for example, if you use an area outside "A", "B", "C" or "D" (for example, point "a"), it will not be shown in great detail.

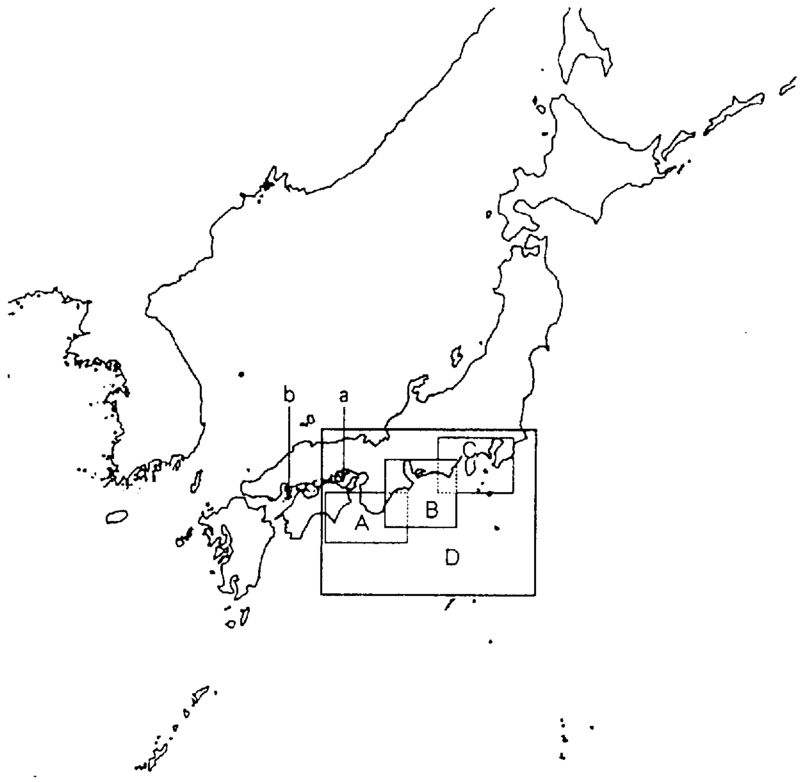
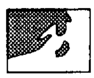
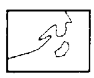


Figure 1-29 Ise Peninsula/Tokai chart (Japan)

Chart status

Several types of icons appear on the display to alert you to chart status. Table 1-3 describes the chart icons.

Table 1-3 Chart-related icons

Icon	Meaning
	Chart properly displayed; full chart reliability.
	Chart overenlarged; low chart reliability. Shrink chart to show "filled" chart icon (above).
	Chart card not inserted or chart card inserted is not compatible with current sea area.

Turning Graphic Displays On or Off

What are the graphic displays?

The graphic displays are any marks, markers or track which you can turn on or off. The 188 is shipped from the factory with often used graphic displays (for example, waypoint, main track, etc.) turned on. You can turn the graphic displays on or off as desired.

Keys you will use

- The **MENU** key displays the main menu. If you get lost in operation, press it to return to the main menu. Press twice to erase the menu.
- The **ESC** key goes to the previous menu.
- The **BACK SPACE** key deletes the character to the left of the data input cursor.

Turning graphic displays on or off

Main track

ON: [MENU] [1] [5] [1] [1] [2]

OFF: [MENU] [1] [5] [1] [1] [1]

Sub track

ON: [MENU] [1] [5] [1] [2] [2]

OFF: [MENU] [1] [5] [1] [2] [1]

Mark/line

ON: [MENU] [1] [5] [2] [2]

OFF: [MENU] [1] [5] [2] [1]

Waypoint

ON: [MENU] [1] [5] [3] [2]

OFF: [MENU] [1] [5] [3] [1]

Chart (memory card)

ON: [MENU] [1] [5] [4] [1] [2]

OFF: [MENU] [1] [5] [4] [1] [1]

Chart (floppy disk)

ON: [MENU] [1] [5] [4] [2] [2]

OFF: [MENU] [1] [5] [4] [2] [1]

Grids

ON: [MENU] [1] [5] [8] [2]

OFF: [MENU] [1] [5] [8] [1]

Cross hair cursor

ON: [MENU] [1] [9] [1] [2]

OFF: [MENU] [1] [9] [1] [1]

Circle cursor

ON: [MENU] [1] [9] [2] [2]

OFF: [MENU] [1] [9] [2] [1]

Parallel cursor

ON: [MENU] [1] [9] [3] [2]

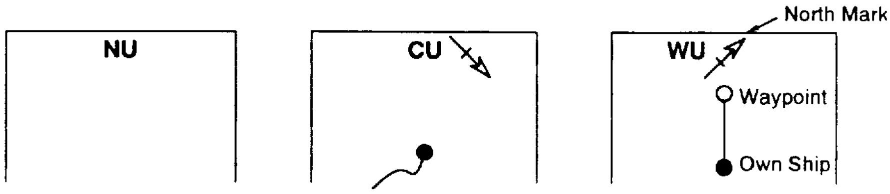
OFF: [MENU] [1] [9] [3] [1]

Selecting Display Orientation Mode

Types of orientation modes

The display can be oriented three ways:

- **North-up**. North is at the top of the display. This mode is suitable for use as a general navigation monitor.
- **Course-up**. Ship's course is at the top of the display.
- **Waypoint-up**. Destination waypoint is at the top of the display.



[North-up] [Course-up] [Waypoint-up]

Figure 1-30 Orientation modes

Procedure

Select orientation mode by doing the following.

1) Press **MENU**, **1** and **2**.

MAIN MENU		DISPLAY SETUP		DISPLAY SETUP
1 DISPLAY SETUP		1 Select Display Mode		
2 TRACK		2 Set Dsp Orientation		2 Set Dsp Orientation
3 MARK		3		
4 LINE		4		
5 WAYPOINT/ROUTE		5 Turn Display On/Off		
6		6		
7 ALARM	➡	7	➡	
8 RECORD/REPLAY		8 Turn Graph On/Off		
9 MISCELLANEOUS		9 Turn Cursor On/Off		
0 OPTION		0 Set Display Brill		
Enter Number:		Enter Number:		Enter Number: 1 North-up 2 Course-up 3 Waypoint-up

Figure 1-31 Displays shown by pressing **MENU**, **1** *and* **2**

2) Press appropriate number key to select orientation mode desired. For the Waypoint-up mode enter the destination waypoint.

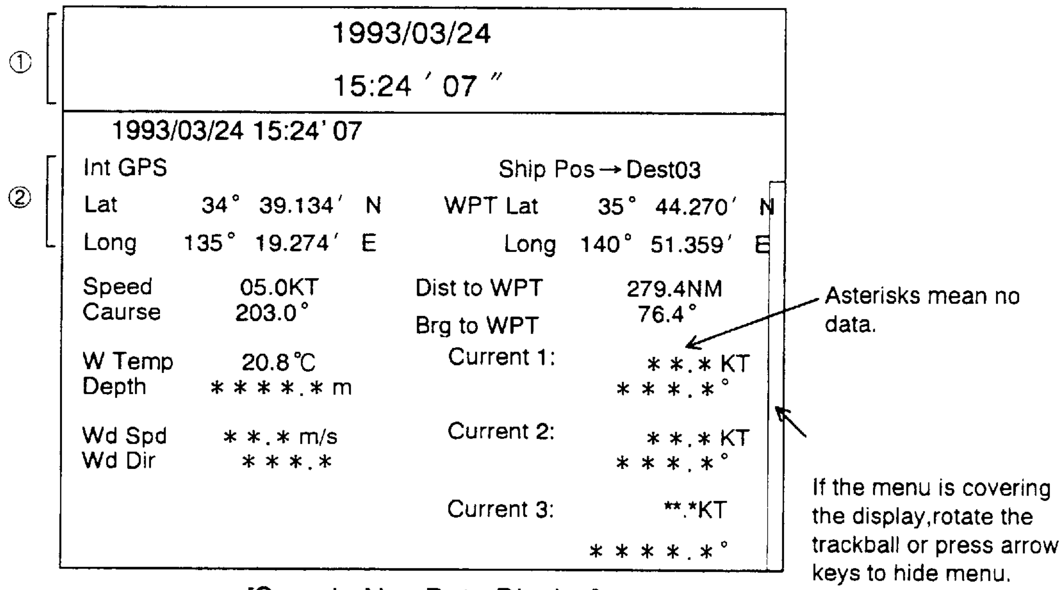
Displaying the Navigation Data Display

What is the navigation data display?

The navigation data display shows various navigation data such as position, ship's speed and course.

Procedure

To display the navigation data display, press **MENU**, **1**, **1** and **2**.



[Sample Nav Data Display]

Figure 1-32 Displays shown by pressing **MENU,1, 1** *and* **2**

Returning to plotter display

To return to the plotter display and erase the menu, press;

[MENU] [1] [1] [1] [MENU] [MENU]

Changing headline

(1) in Figure 1-32 is called the headline. You can select what data to display there by pressing;

[MENU] [9] [1] [2] [4] [2]

Changing navaid display

(2) in Figure 1-32 is the navaid position display. The navaid selected here does not change the navaid selected to feed position data for plotting ship's track. To change the navaid display, press;

[MENU] [9] [1] [2] [4] [1]

The Cursors

Types of cursor

The 188 has three cursors:

- Cross hair cursor
- Circle cursor, and
- Parallel-line cursor.

Cross hair cursor

This cursor mainly functions to

- select a location where to enter a mark, waypoint, etc.
- select item to erase, and
- measure range and bearing to a location.

Circle cursor

The circle cursor can be used to measure the range to a mark on the screen, similar to how you operate the Variable Range Marker on a radar. Locate the center of the circle on the own ship mark by operating the trackball. Adjust the radius of the circle with the **Scale** keys so the edge of the circle touches the center of the mark.

Parallel cursor

The parallel cursor consists of twin radial lines which can be rotated manually about its axis coincident with the center of the display. Its main use is for bearing determination. You change slant by [key] / [key] and width by [key] / [key] .

Enabling or disabling cursors

In the default setting only the cross hair cursor is enabled. You can turn on or off the other cursors by referring to page 1-26.

Selecting a cursor

The **SEL** key enables shifting of the cursors, display or menu by the trackball. Each time you press the key the icon at the bottom left-hand corner of the display changes in the sequence shown in Figure 1-33, to show you which cursor or item can be shifted by the trackball. Note that no cursor icon appears if its associated cursor is disabled through the menu.

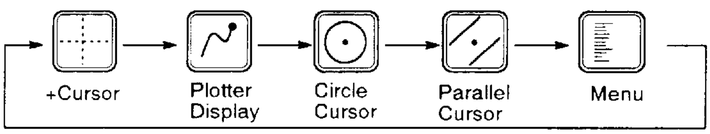


Figure 1-33 Icons which appear at the bottom left-hand corner of the display when the **SEL** *key is pressed*

Confirming Data

Procedure

You can quickly confirm mark, line and waypoint data by doing the following.

1) Press **MENU**, **9** and **3**.

```
Set +cursor on item and
press ENT key.
```

2) Set the cursor on the item to confirm data.
3) Press **ENT**.

Data for the item selected appears at the top of the menu. Figure 1-34 shows sample data confirmation displays.

```
Main Track:

 1993/ 7/14 12:23'  50"
34°44.459' E   135°21.379' E
```

Main Track

```
Waypoint :        1

34°40.568' E   135° 16.896' E
ABC
```

Waypoint

```
Mark:          ◇

 1993/ 7/14 10:44'  35"
34° 43.684' E   135° 14.343' E
```

Mark

Figure 1-34 Sample data confirmation displays

Ship's Position Display

Introduction

You may display position in latitude and longitude, Loran C LOPs, Decca LOPs or Loran A LOPs.

```
 34°  44.195'  N
135°  21.285'  E
```

Indication of your ship's position
(Lat/Long,Loran LOP or DECCA LOP)

Figure 1-35 Ship's position display

Loran C LOPs

To display position in Loran C LOPs;

1) Press **MENU**, **9**, **1**, **2** and **8**. Your display should look like Figure 1-36.

```
POSITION DISPLAY MODE

1 Lat/Long
2 Loran C LOPs
3 Decca LOPs
4 Loran A LOPs
```

Figure 1-36 POSITION DISPLAY MODE menu

2) Press **2**.
3) Enter four digit GRI code and press **ENT**.
4) Enter secondary stations and press **ENT**.
5) The prompt asks you if you want to apply offset to position information. Press **1** for no offset, or **2** to apply offset.

■ **NOTE:** *Variation in signal propagation can cause constant errors in the computed LOP. You can enter LOP corrections, in the Loran C receiver, to further refine the LOP coordinates on a particular chart.*

6) If you pressed **2** in step 5 enter offset(s).

Decca LOPs

To display position in Decca LOPs;

1) Press **MENU**, **9**, **1**, **2**, **8** and **3**.
2) Enter chain code in two digits and press **ENT**.
3) Enter secondary stations and press **ENT**.

4) The prompt asks you if you want to apply offset to position information. Press **1** for no offset, or **2** to apply offset.

5) If you pressed **2** in step 4 enter offset(s).

Loran A LOPs

The procedure which follows shows how to display position in Loran A LOPs.

1) Press **MENU**, **9**, **1**, **2**, **8** and **4**.
2) Enter station pairs and press **ENT**.
3) The prompt asks you if you want to apply offset to position information. Press **1** for no offset, or **2** to apply offset.
4) If you pressed **2** in step 4 enter offset(s).

Latitude and longitude

Press **MENU**, **9**, **1**, **2**, **8** and **1**.

TRACK

This chapter teaches you all about the ship's track.

You will learn how to

- change track color manually
- change track color automatically by variations of water temperature or depth
- set track plotting interval
- set smoothing
- suspend and resume recording of the track
- change track attributes
- display specific portions of the track, and
- erase the track.

Track Fundamentals

Two sets of tracks

The track plots your ship's movement by using position data fed from a navaid. The 188 can plot two ship's tracks, fed by different navaids.

Main track

Fed by main navaid. (For the GP-188 it's the internal GPS receiver.)

Sub track

Fed by auxiliary navaid (Satellite Navigator, Decca Navigator, Loran Receiver, GPS Navigator, Omega Navigator, etc.).

Default main track attributes

- Navaid: Internal GPS (GP-188)
- Color: white
- Plotting interval: 0.10 nautical miles

Sample track display

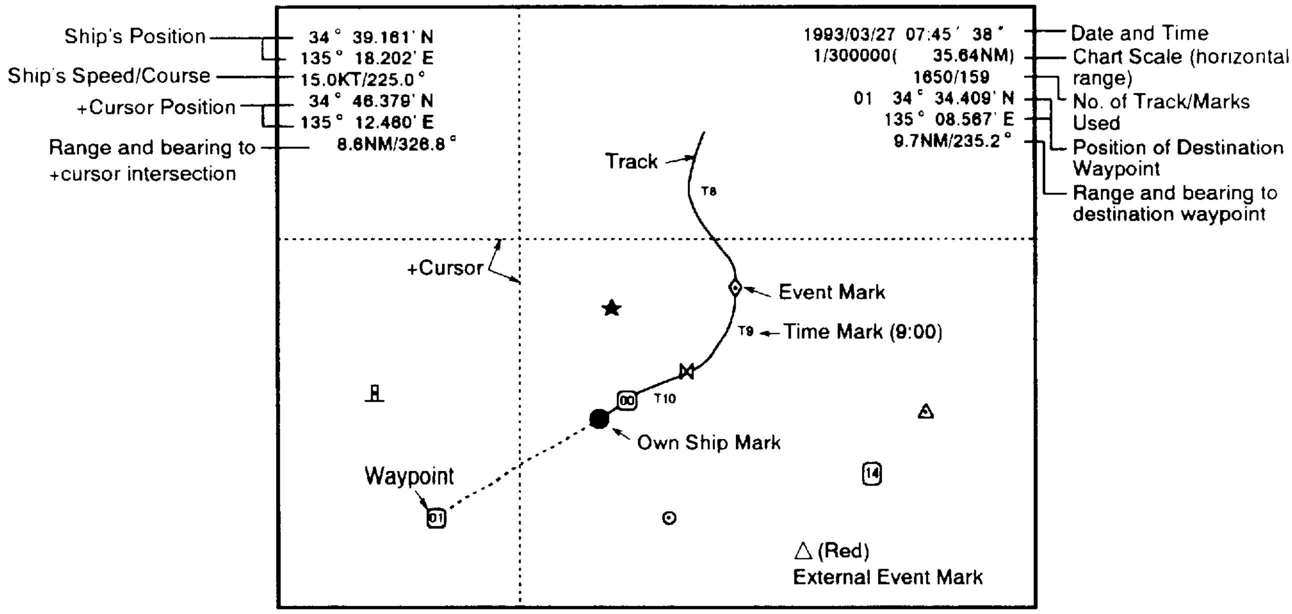


Figure 2-1 Sample track display, no grid nor chart displayed

Turning main track on/off

The main track is displayed in the default setting.

1) Press **MENU**, **1**, **5**, **1** and **1**.

```
1 Main Track
-------------
Enter Number:

1  OFF
2  ON
```

Figure 2-2 Turning main track on/off

2) Press **2** to display the main track; **1** to turn it off.

Turning sub track on/off

The sub track is not displayed in the default setting.

1) Press **MENU**, **1**, **5**, **1** and **2**.
2) Press **2** to display the main track; **1** to turn it off.

■ **NOTE:** *The sub track mark (+) remains on the display when the sub track is turned off. To erase the mark, press* **MENU**, **2**, **1**, **2**, *and select same navaid which feeds navigation data for main track.*

Selecting navaid priority for main track

When the main navaid is not working, the 188 automatically selects (default setting) a back-up navaid to feed ship's position. Select navaid(s) and priority as follows.

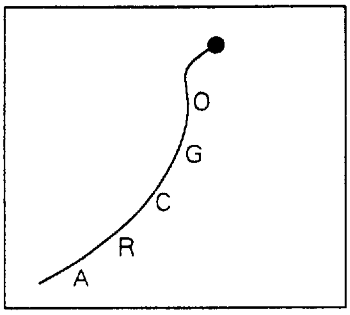
1) Press **MENU**, **2**, **1** and **1**. The bottom of the menu should look like Figure 2-3.

```
Priority
1  DR        5  Decca
2  Omega     6  GPS
3  Loran A   7  Int GPS
4  Loran C   8  User
```

Figure 2-3 Navaid priority selection menu

2) Enter navaid priority from highest to lowest. For example, to enter priority of internal GPS (GP-188 only), external GPS, Loran C, press **7**, **6**, **4** and **ENT**.

■ **NOTE:** *When you change the navaid which feeds navigation data for the main track, a letter appears on the display to inform which navaid is now feeding navigation data.*



A letter appears near the track when the navaid is changed.
A = LoranA   O = Omega
C = LoranC   R = DR
D = Decca
G = GPS

Figure 2-4 How the display shows which navaid is feeding navigation data

Selecting navaid for sub track

Select the navaid which is to feed position data for plotting the sub track.

1) Press **MENU**, **2**, **1** and **2**.
2) Select navaid by pressing appropriate numeral key.

Turning navaid back-up on or off

When the navaid feeding position data for the main track is not working, an external navaid is automatically selected (default setting) to feed position data. You can turn back-up on or off as follows.

Turning on back-up (data with error flag detected)

MENU, **2**, **1**, **9**, **2** and **1** (no position offset) or **2** (apply position offset).

No back-up when error flag is detected

MENU, **2**, **1**, **9** and **1**

■ **NOTE:** *When the main track is plotted by position data fed from the navaid which plots the sub track, the sub track is not plotted.*

Recording the sub track

The sub track can be recorded. If it is not recorded it is erased whenever the picture is shifted or the chart scale is changed. When you record the sub track the track memory is divided equally between the main and sub tracks.

Recording

MENU, **2**, **2**, **5** and **2**

Turning off recording

MENU, **2**, **2**, **5** and **1**

Track Color

Introduction

The color of the track can be manually changed whenever you like, or automatically by variations in water temperature or depth (external sensors required).

Manual change

You can manually change the color of track as often as you like, to one of seven colors. (The colors available appear on numeral keys 1 through 7.) For example, you might plot the track in yellow while fishing and red on the return trip home. To change track color, press **TRACK COLOR**, and **1** (main track) or **2** (sub track).

Automatic change

By water temperature

With water temperature sensor or echosounder connection you can set up to change track color automatically according to water temperature. This feature is especially useful when searching for a particular species of fish, since each species has its own habitable temperature.

By depth

With echosounder connection the 188 can automatically change track color by variations in depth.

■ **NOTE:** *The sub track may also be set to change color by variations of water temperature or depth. The procedure is similar to that for the main track.*

Changing track color by water temperature

There are two ways to change track color by water temperature: by preset temperature range or unit place.

Preset temperature range

The color of the track changes when the water temperature is out of the preset range. For example, you can set up to paint the track red when the water temperature is 20 degrees Centigrade or higher.

1) Press **MENU, 9, 1, 2** and **5.**

Temp Unit: ℃
Coloring: Preset

← Current Setting

TRACK COLOR BY TEMP

Menu	Default Setting
1 RED ≧ 20.0	← Red track for temperature over 20.0℃
2 YEL ≧ 17.5	← Yellow track for temperature between 17.5℃ and 19.9℃
3 GRN ≧ 15.0	← Green track for temperature between 15.0℃ and 17.4℃
4 LBLU ≧ 12.5	← Light-blue track for temperature between 12.5℃ and 14.9℃
5 PPL ≧ 10.0	← Purple track for temperature between 10.0℃ and 12.4℃
6 BLU ≧ 5.0	← Blue track for temperature between 5.0℃ and 9.9℃
7 WHT < 5.0	← White track for temperature less than 5.0℃
8	
9 Coloring Pattern	
0 Unit of Temperature	

Enter Number:

Figure 2-5 TRACK COLOR BY TEMP menu, by preset temp

2) Press **9** and **1** to select "Preset Temp".

3) Set temperature range for each color. For example, to change track color to red when the water temperature goes above 18 degrees Centigrade;

   1. Press **1**.
   2. Press **1, 8** and **0** and **ENT**.

   To change track color to yellow when the temperature is between 16 degrees Centigrade and 17.9 degrees Centigrade;

   3. Press **2**.
   4. Press **1, 6, 0** and **ENT**.

4) Set other colors similarly.

5) Change unit of water temperature measurement, if desired. Current selection appears at the top of the menu.

   1. Press **0**.
   2. Select unit. Press **1** for Celsius; **2** for Fahrenheit.

   ■ **NOTE:** *Water temperature settings are not converted when you change unit of measurement.*

6) Press **MENU** twice to return to the plotter display.

By unit place

This setting paints the track in up to five colors according to unit place selected. For example, you can set up to change the track color for every 0.2 degrees of water temperature change.

1) Press **MENU, 9, 1, 2, 5, 9** and **2**.

```
Temp Unit: °C
Coloring:  Unit Place

TRACK COLOR BY TEMP

1  RED    0, 1
2  YEL    2, 3
3  GRN    4, 5
4  CYN    6, 7
5  PPL    8, 9
6
7
8
9  Coloring Pattern
0  Unit of Temperature

Enter Number:

  1  □□.■
  2  □■.□
```

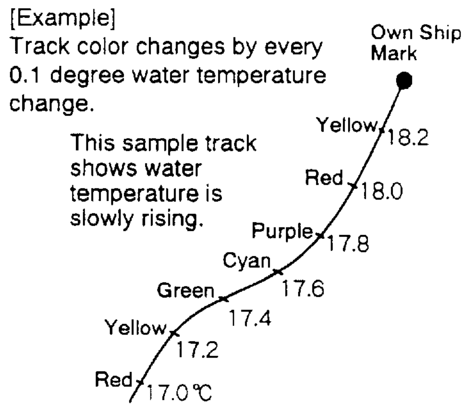


Figure 2-6 TRACK COLOR BY TEMP menu, by unit place

2) Select unit place. Press;

   [1] (0.1 degree place). Track changes color every 0.2 degrees of water temperature change. When the water temperature changes totally one degree the unit paints the track in red again.

   [2] (one degree place). Track changes color every two degrees of water temperature change. When the water temperature changes totally 10 degrees the unit paints the track in red again.

3) Change unit of water temperature measurement, if desired. Current selection appears at the top of the menu.

4) Press **MENU** twice to return to the plotter display.

Changing track color by water depth

There are two ways to change track color by depth: by preset depth range or unit place.

Preset depth range

The color of the track changes when the depth is out of the preset depth range. For example, you could set up to paint the track in red when the depth is more than 900 meters.

1) Press **MENU, 9, 1, 2** and **6**.

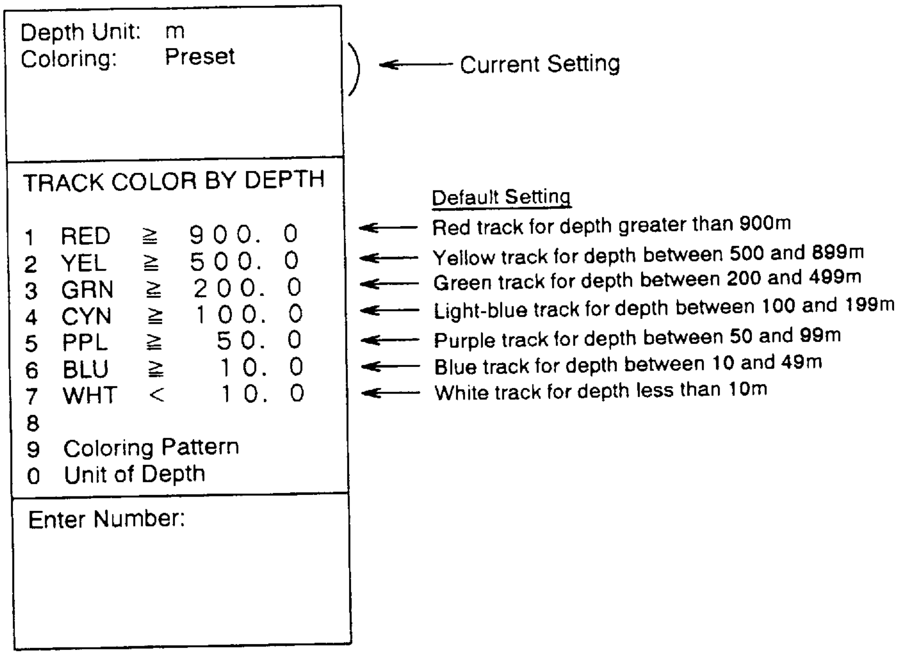


Figure 2-7 TRACK COLOR BY DEPTH menu, by preset depth

2) Press **9** and **1** to select "Preset Depth".

3) Set depths which cause the 188 to change track color. For example, to change track color when the depth is more than 700 meters;

   1. Press **1**.

   2. Press **0, 7, 0, 0, 0** and **ENT**.

4) Set depth for other colors similarly.

5) Change unit of depth measurement, if desired. Current selection appears at the top of the menu.

   1. Press **0**.
   2. Select unit of measurement;

      - 1 = meter
      - 2 = feet
      - 3 = fathom
      - 4 = hiro, or
      - 5 = passi and braza

■ **NOTE:** *Water depth settings are not converted when you change unit of depth measurement.*

6) Press **MENU** twice to return to the plotter display.

By unit place

This setting paints the track in up to five colors according to unit place selected. For example, you can set up to change the track color for every two meters of water depth change.

1) Press **MENU, 9, 1, 2, 6, 9** and **2**.

```
Depth Unit :  m
Coloring:     Unit Place

TRACK COLOR BY DEPTH

1  RED   0, 1
2  YEL   2, 3
3  GRN   4, 5
4  CYN   6, 7
5  PPL   8, 9
6  BLU
7  WHT
8
9  Coloring Pattern
0  Unit of Depth

Enter Number:

  1  □□□■. □
  2  □□■□. □
  3  □■□□. □
```

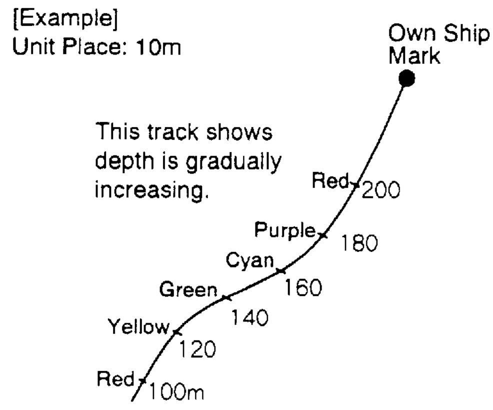


Figure 2-8 TRACK COLOR BY DEPTH menu, by unit place

2) Select unit place.

   1 (one meter place). Track color changes every two meters of depth change up to 10 meters.

   2 (10 meter place). Track color changes every 20 meters of depth change up to 100 meters.

   3 (100 meter place). Track color changes every 200 meters of depth change up to 1000 meters.

3) Change unit of depth measurement, if desired.

4) Press **MENU** twice to return to the plotter display.

Setting Track Plotting Interval

Introduction

Earlier you learned how to set the track plotting interval by time, by pressing the **TRACK INTVL** key. You can also set it by distance. One advantage of this method is you won't use the track memory when your ship is dead in water.

By distance

To set track plotting interval by distance;

1) Press **MENU, 2, 2** and **3**.

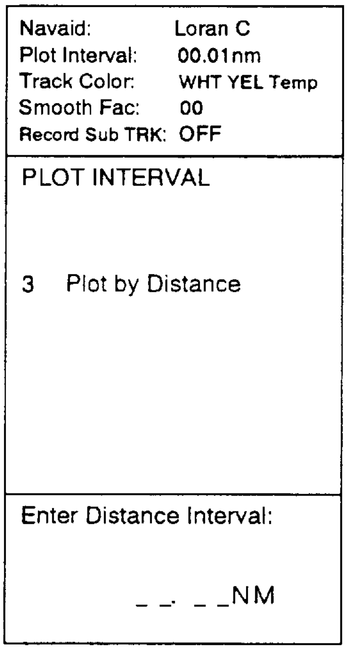


Figure 2-9 PLOT INTERVAL menu, plot by distance

2) Enter plotting interval. To enter one nautical mile, for example, press **0, 1, 0, 0** and **ENT**.

By time

To set track plotting interval by time through the menu;

1) Press **MENU, 2, 2** and **2**.
2) Enter plotting interval. To enter one minute, for example; press **0, 1, 0, 0** and **ENTER**.

Smoothing

What is smoothing?

Even when the vessel is sailing in a straight line the track shown on the display looks irregular. This is due to signal variation of the navaid. To smooth out the irregularity, change the smoothing factor.

Setting

To change the smoothing from "00" to "05", for example;

1) Press **MENU**, **2** and **4**.

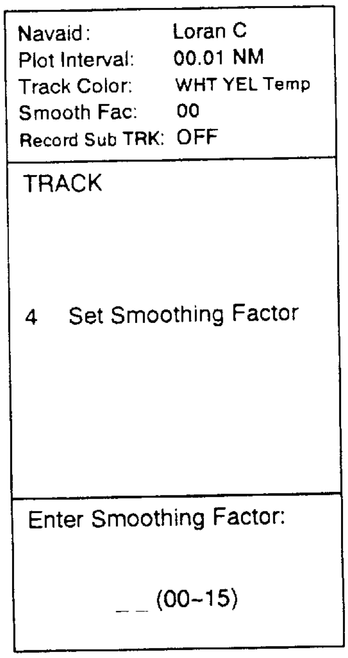


Figure 2-10 TRACK menu, smoothing factor

2) Enter smoothing factor. If it is "05", press **0**, **5** and **ENT**.

More about smoothing

In Figure 2-11, the actual ship's track is shown by a wide hatched arrow and the position being fed from the navaid is shown by black dots. If no smoothing is applied, the track shown on the display will look irregular due to signal variations.

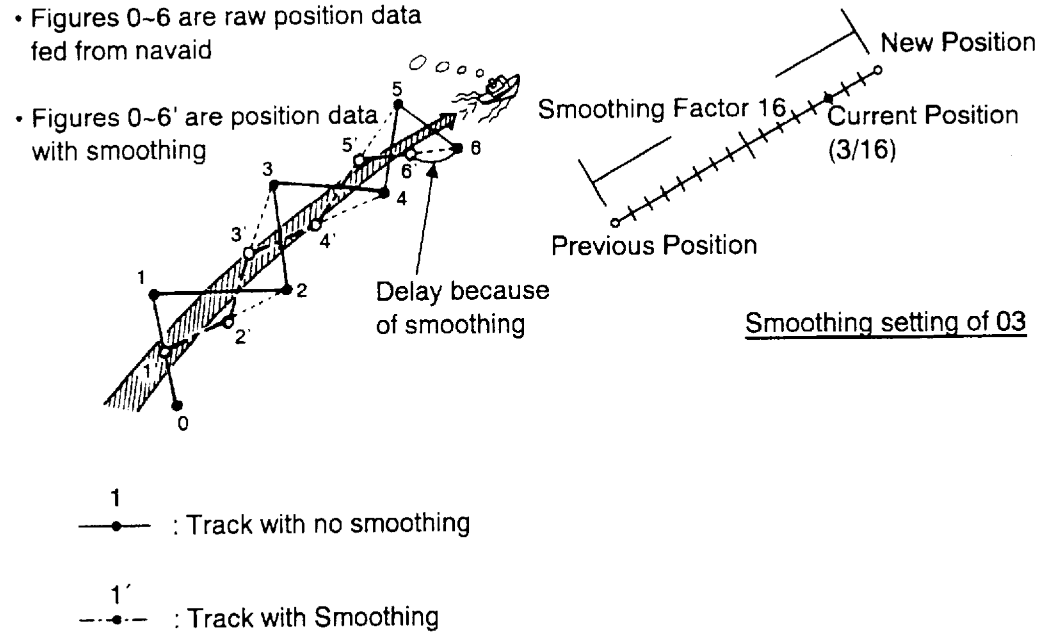


Figure 2-11 Comparing track with smoothing and no smoothing

For instance, number 03 provides a weighting factor of 13/16 for new data and 3/16 for previous data. The higher the smoothing number, the slower the position updating becomes. In Figure 2-12, the track shown by the broken line has a time delay more than the one shown by the dot-dash line, because of higher smoothing rate.

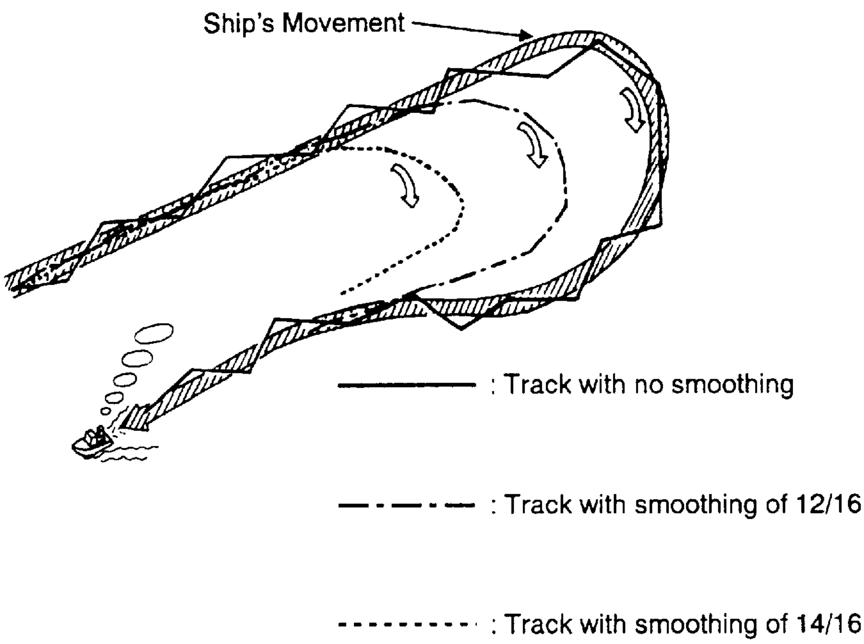


Figure 2-12 Comparing track and different smoothing factors

Suspending/Resuming Recording of the Track

Why suspend recording the track?

When your ship is at anchor or returning to port you probably will not need to record the track. You can stop recording the track, to conserve the track memory, by actuating the "track hold" function.

Suspending and resuming recording

Press **TRACK HOLD** to suspend or resume recording. When recording is suspended, the own ship mark is shown by a hollow circle.

Connecting track when recording is resumed

When you resume recording the track the 188 can connect the points where recording was suspended and resumed. (The default setting does not connect the points.)

1) Press **MENU, 9, 1, 8, 2** and **1**.

```
MISC. FUNCTIONS

2   Track During Hold

Enter Number:

1   Don't Connect
2   Connect
```

Figure 2-13 SET MISC. FUNCTIONS menu, track during hold

2) Press **1** for no connection; **2** to connect.

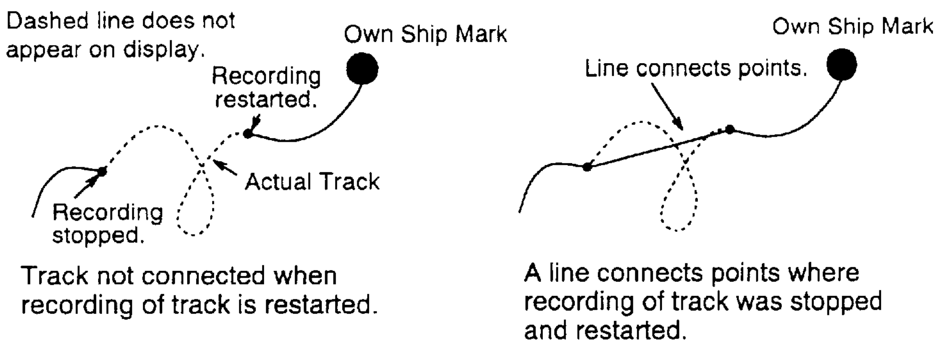


Figure 2-14 Connection/no connection of track when track recording is resumed

Displaying track not recorded

You can display the track not recorded while the recording of the track is suspended. However, if you shift, shrink or enlarge the display the portion of the track which is not recorded is erased.

1) Press **MENU, 9, 1, 8, 2** and **2**.

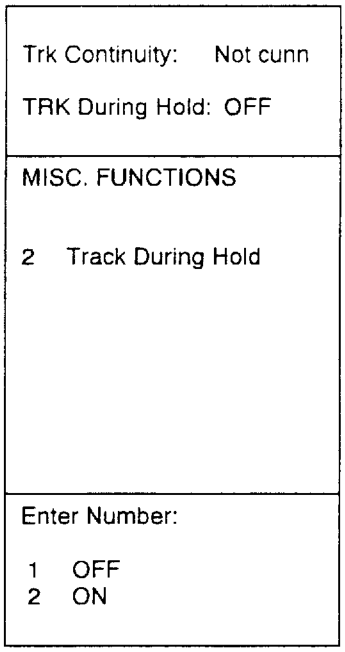
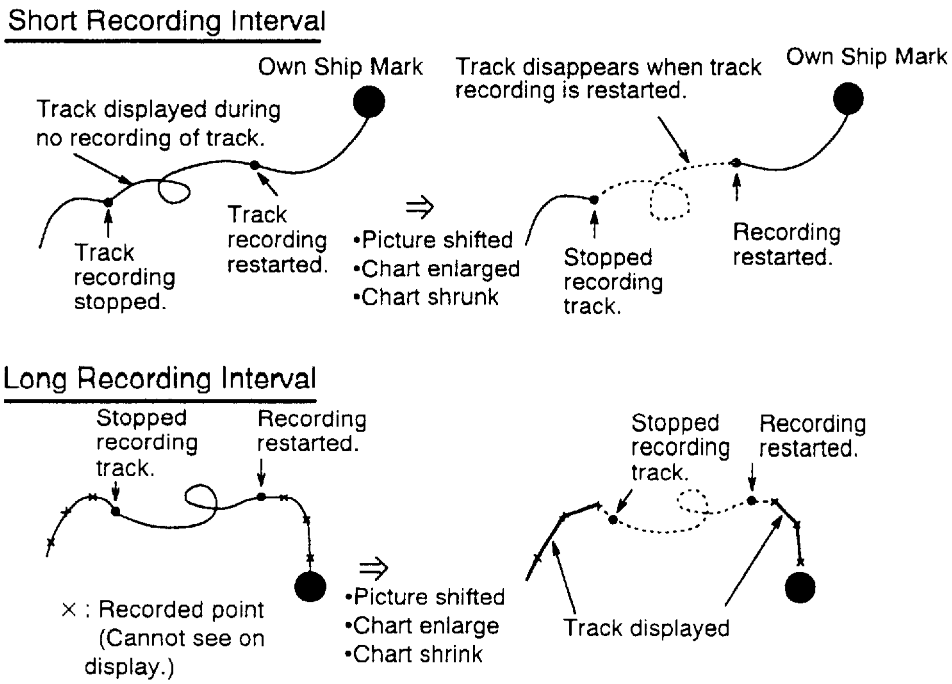


Figure 2-15 MISC. FUNCTIONS menu, track during hold

2) Press **1** for no track display; **2** to display the track.



Changing Track Attributes

Introduction

This section shows how to change track color and track line type.

Color of past track

Changing from one color to another

1) Press **MENU, 2, 9** and **1**.

```
CHANGE TRACK ATTRIBUTE

1   Change Color (All)


Old Color?:
1   RED     5   PPL
2   YEL     6   BLU
3   GRN     7   WHT
4   CYN
```

Figure 2-16 CHANGE TRACK ATTRIBUTE menu, change color (all)

2) Enter the color you want to change. If you want to change the color of the white track, for example, press **7**.
3) Enter new color. For example, if you want the color of the track selected in step 2 to be red, press **1**.

Changing color of specific portion of track

1) **MENU, 2, 9** and **2**.
2) Select the track you want to change;

   1. Select starting point by the cursor and then press **ENT**.
   2. Select end point by the cursor and then press **ENT**.

■ **NOTE:** *If there are no recorded track points in the starting or end point, an error message appears. In this case select points again and then press* **ENT**.

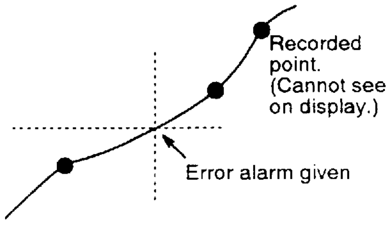


Figure 2-17 When there is no recorded track points in the area selected

3) Enter new color.

Line type of past track

Four types of track line displays are available:

1	————	3	- - - - - -
2	················	4	—·—·—·—

Figure 2-18 Track line types

1) Press **MENU**, **2**, **9** and **4**.

CHANGE TRACK ATTRIBUTE

4 Change Line Type

Place +cursor on starting point and press ENT.

Figure 2-19 CHANGE TRACK ATTRIBUTE menu, change line type

2) Select the portion of the track you want to change;

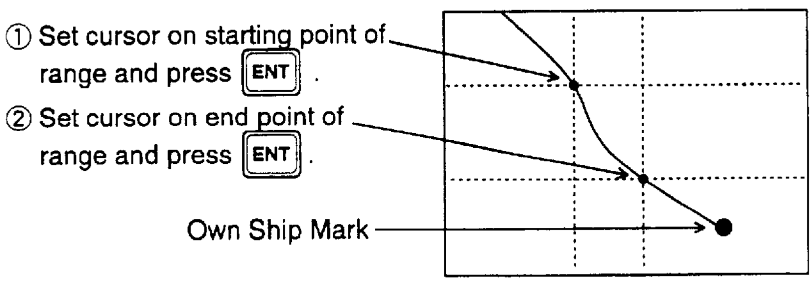


Figure 2-20 How to select track to change

3) Select new line type. To select dotted line, for example, press **2**.

Displaying/Restoring Specific Track

How to display specific track

There may be times when you want to view only a certain portion of the track. You can do it by the following methods.

- by color(s)
- by time
- by line type(s), and
- by number of track points.

When you are finished viewing a specific portion you can completely or partially restore any track temporarily erased.

Displaying specific track

<u>**By color**</u>

1) Press **MENU**, **2**, **6** and **1**.

```
Dsp Color? _ _ _ _ _
1  RED       5  PPL
2  YEL       6  BLU
3  GRN       7  WHT
4  CYN
```

Figure 2-21 Track color selection menu

2) Select track color you want to display. (You can select up to seven.) To display only the red, white and blue track, for example, press **1**, **6**, **7** and **ENT**.

<u>**By time**</u>

1) Press **MENU**, **2**, **6** and **2**.

```
DISPLAY SPECIFIC TRK

2  By Time

-----------------------------
Enter Starting Time:

      _ _Y_ _M_ _D
        _ _ : _ _
```

Figure 2-22 DISPLAY SPECIFIC TRACK menu, by time

2) Enter starting time and date. Enter year by two digits for year and time by 24-hour notation in that order. If the date and time are April 10, 1993, 14:05, for example, press;

[9] [3] [0] [4] [1] [0]

[1] [4] [0] [5] [ENT]

3) Enter end time.

By line type

1) Press **MENU**, **2**, **6** and **3**.
2) Select type of line to display. (You may select up to four.) To display only the solid line track, for example, press **1** and **ENT**.

By track size

1) Press **MENU**, **2**, **6** and **5** (or **6** for sub track).
2) Enter number of track points in six digits. For example, press **0**, **0**, **1**, **0**, **0**, **0** and **ENT** to display the latest 1,000 points of track.

Restoring temporarily erased track

The track that you temporarily erased (in the previous section) can be restored, by doing the following.

1) Press **MENU**, **2**, **6** and **9**.

```
Dsp Color:  ■■■■■■■
Time Fm:    1993/03/19  0: 0
Time To:    1993/03/31 23:59
Lin Typ:    — ····· – – —··
Track(M/S): 100000/20000
-----------------------------
CANCEL SELECTION

1   By Color
2   By Time
3   By Line Type
4
5   By Track Size (Main)
6   By Track Size (Sub)
7
8
9   Cancel All
0   No Change
-----------------------------
Enter Number:
```

Figure 2-25 CANCEL SELECTION menu

2) Select the item you want to restore.
3) Press **2** to restore item selected in step 2.

Erasing Track

Introduction

When the display becomes full of track you may want to erase all or specific portions of the track permanently to clear the display. You can erase track four ways:

- by color(s)
- by time range
- by line type(s), and
- by two points.

By color

Follow the procedure below to erase track by color.

1) Press **MENU**, **2**, **8**, **1** and **1**.
2) Select color(s) you want to erase and then press **ENT**. To erase red and yellow tracks, for example, press **1**, **2** and **ENT**.
3) Press **0**.
4) Select area where to erase track.
   - On screen
   - Off screen
   - Specified area
   - On + off screen
5) If you selected "Specified area", select the track to erase as follows.

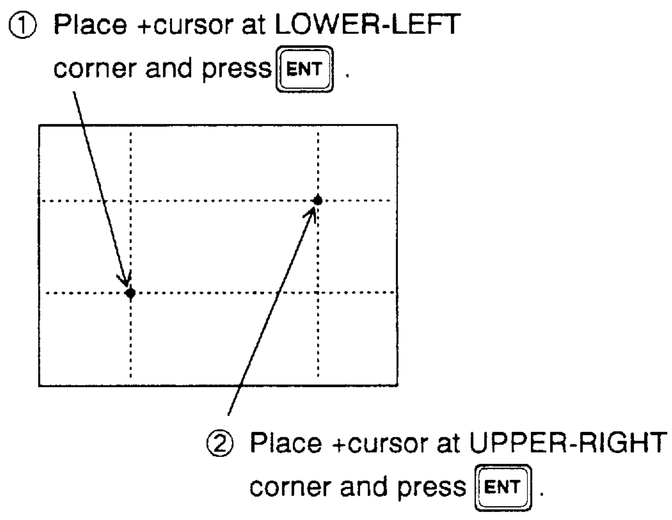


Figure 2-26 ERASE TRACK menu, by color

6) Press **2**.

By time

To erase track by time;

1) Press **MENU, 2, 8, 1** and **2**.
2) Enter starting time; two digits for year and 24-hour notation. If the starting time is April 10, 1993, 14:05, for example, press;

[9] [3] [0] [4] [1] [0]

[1] [4] [0] [5] [ENT]

3) Enter end time.
4) Press **0**.
5) Select area where to erase track.
6) Press **2**.

By line type

Follow the procedure below to erase track by line type.

1) Press **MENU, 2, 8, 1** and **3**.
2) Select the type of line you want to erase and then press **ENT**.
3) Press **0**.
4) Select area where to erase track.
5) Press **2**.

Between two points

To delete track between two points;

1) **MENU, 2, 8** and **2**.
2) Select track to erase by the cursor.

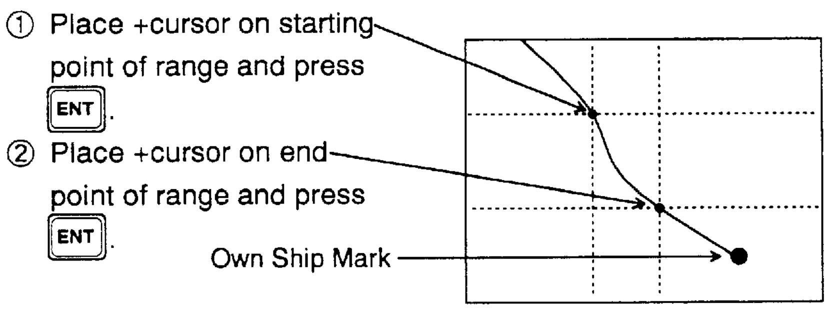


Figure 2-27 How to select track to erase

3) Press **2**.

■ **NOTE:** *Unconnected track cannot be erased by the previous procedure.*

MARKS

This chapter describes how to process marks.

Instruction includes how to

- enter marks by various methods
- connect marks
- enter target point mark
- erase marks
- change color and shape of marks, and
- display the comment list, and
- display/restore specific marks.

Mark Fundamentals

Use of marks

Marks can be electrically drawn on the screen to depict navigation buoys, sunken vessels, lighthouses, etc. Further, marks can denote when a net is thrown, fishing started, net retrieved, etc.

Types and colors of marks

Marks are available in ten types and seven colors. The colors available appear on numeral keys 1 through 7. In addition to the those marks there is a special mark called the target point mark. This mark is colored red and appears on the display as an "×" mark. It usually marks a danger point. More on this mark later.

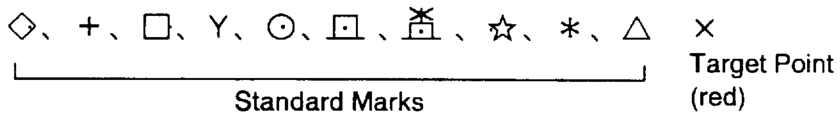


Figure 3-1 Marks

Methods of entering a mark

There are seven methods by which you can enter a mark:

- by latitude and longitude coordinates
- by range and bearing from your ship
- by Loran C LOPs
- by Decca LOPs
- by ship's position
- by cursor, and
- by Loran A LOPs.

■ **NOTE:** *For your reference, the Appendix contains Loran C, Loran A and Decca chain information.*

Auxiliary marks

In addition to the marks mentioned above, there are marks which are automatically input by external equipment. They are called auxiliary marks, and include

- Time mark
- External event mark
- Satellite navigator mark
- Fish mark
- Water temperature mark
- Depth mark
- Course vector, and
- Current (tide) vector.

You will learn how to turn the auxiliary marks on or off later on in this chapter.

Entering Marks

By latitude and longitude

Follow the procedure below to enter a mark by latitude and longitude coordinates.

1) Press **MENU, 3, 0** and **1**.
2) Press **3**.
3) Enter latitude. To enter 34°38.838 minutes North latitude, for example;

[3] [4] [3] [8]

[8] [3] [8] ([CHG]) [ENT]

(Press **CHG** *for South latitude, if necessary.)*

4) Enter longitude followed by the **ENT** key.

To enter another mark by the same method, repeat steps 2 through 4.

By range and bearing from your ship

This method is useful for denoting the location of a target found on radar.

1) Press **MENU, 3, 0** and **2**.
2) Press **3**.
3) Enter range (0 to 999.999 nautical miles) from your ship to mark. For example, 45 nautical miles;

[0] [4] [5] [0] [0] [0] [ENT]

4) Enter bearing (0 to 360 degrees). For example, 135 degrees;

[1] [3] [5] [0] [ENT]

By Loran C LOPs

To enter a mark by Loran C LOPs;

1) Press **MENU, 3, 0** and **3** to select Loran C LOPs.
2) Press **3**. The prompt asks you to enter GRI.
3) Enter four digit GRI code. For example, to enter GRI 9970, press **9, 9, 7, 0** and **ENT**.

4) Enter two LOPs, in any order. To enter 60400.5 and 35800.3;

6 0 4 0 0 5 ENT

3 5 8 0 0 3 ENT

5) Enter estimated latitude and longitude for LOPs. To enter 35°23 minutes North latitude, 139°00 minutes East longitude;

3 5 2 3 (CHG) ENT

1 3 9 (CHG) ENT

(Press **CHG** *to switch coordinates, if necessary.)*

By Decca LOPs

The procedure which follows shows how to enter a mark by Decca LOPs.

1) Press **MENU**, **3**, **0** and **4**.
2) Press **3**.
3) Enter Decca chain code in two digits, for example, chain 35.
4) Enter LOPs (two), in any order, by using the following codes.

A = 1	B = 2	C = 3	D = 4	E = 5
F = 6	G = 7	H = 8	I = 9	J = 0

To enter 1C15.63 and 1J23.45, for example;

1 3 1 5 6 3 ENT

1 0 2 3 4 5 ENT

5) Enter estimated latitude and longitude for LOPs.

By Loran A LOPs

To enter a mark by Loran A LOPs;

1) Press **MENU**, **3**, **0** and **7** to select Loran A LOPs.
2) Press **3**. The prompt asks you to enter station pair.
3) Enter station pair and press **ENT**.
4) Enter two LOPs in any order.
5) Enter estimated latitude and longitude.

Connecting Marks with Lines

Introduction

In the next chapter you will learn how to draw lines on the display. This section shows you how to connects marks with lines. Note that you cannot connect marks by using the **MARK ENT** key.

Procedure

To connect marks with a line;

1) Press **MENU, 3, 7** and **1**.
2) Press **3** and enter mark.
3) Press **7** and **2.**
4) Select line type by pressing appropriate numeral key.

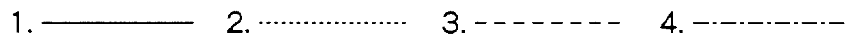


Figure 3-2 Line types

5) Press **3** and enter mark. A line connects the two marks you entered.
6) Repeat step 5 to complete the line. (If you want to change line type go to step 3.)

■ **NOTE:** *You can erase a mark on a line by selecting the mark with the cursor and then pressing* **CLR**.

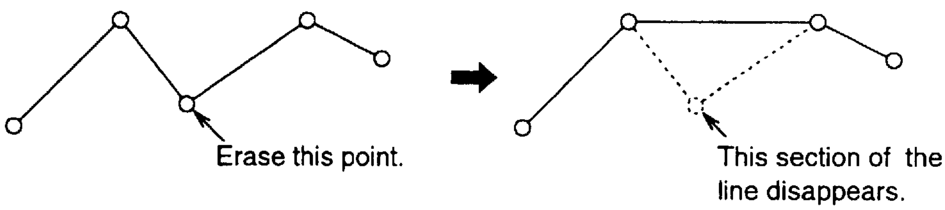


Figure 3-3 What happens to a line when one of its segments is erased

The Target Point Mark

What is the target point mark?

The target point mark is a special mark which you can use to denote any important location. A good example of a target point mark is a wreck. The target point mark appears on the display as a red "×".

Storage capacity

You can enter up to ten target points, by assigning each mark a number. (Only one point can be entered if you do not enter target number.) The 188 numbers target points from 01 to 10.

Target point mark and target proximity alarm

Using a target point mark, you can set up the 188 (in Chapter 6) to sound the audible alarm when your vessel comes within a certain distance to any target point mark.

Entering a target point mark

Like entry of an ordinary mark, you can enter a target point mark seven ways. However, a target point mark cannot be entered by the **MARK ENT** key.

1) Press **MENU**, **9**, **6** and **0**. The display prompts you to select entry method.
2) Select an entry method by pressing appropriate numeral key.
3) Press **1** to enter target point mark number.
4) Enter target point mark number in two digits. If it is 04, press **0**, **4** and **ENT**.

   ■ **NOTE:** *If the target point is already used its latitude and longitude appear at the top of the menu. You can write over position data of the target point, or press* **1** *to enter a different target number.*

5) Press **3** to enter the target point mark.
6) Enter target point mark according to method selected in step 2.

Erasing a target point mark

Operate the trackball to set the cursor on target point mark and then press **CLR**.

Erasing Marks Collectively (by shape)

Introduction

Earlier you learned how to erase marks one by one by using the cursor and the **CLR** key. Marks can also be erased collectively by shape, color or time.

Procedure

To erase all marks by mark shape;

1) Press **MENU, 3, 8** and **3**.
2) Select source of marks to erase. Press **1** for marks you entered, or **2** for marks input by external equipment.
3) For internal marks, select shape(s) by pressing numeral key(s) and then press **ENT**.

■ **NOTE:** *To escape, press* **9**.

4) Press **0**.

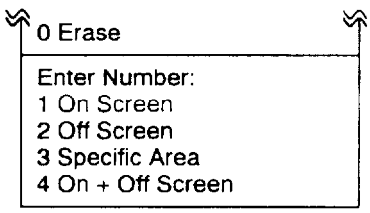


Figure 3-4 ERASE MARK menu, selecting location of marks to erase

5) Select area where you want to erase marks, by pressing appropriate numeral key.

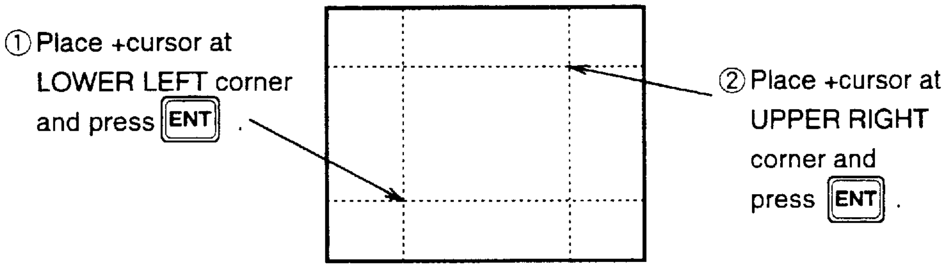


Figure 3-5 How to select area where to erase marks

6) Press **2**.

Changing Mark Attributes

Introduction

You can change the color and shape of marks already entered.

Procedure

Follow the procedure below to change mark's attributes.

1) Press **MENU**, **3** and **9**. The prompt asks you to select a mark.

```
9 Change Mark Attrib

Place +cursor on mark
and press ENT.
```

Figure 3-6 MARK menu, selecting mark to change

2) Set the cursor on the mark.
3) Press **ENT**.

```
New Mark Shape?
1 ◇  5 ⊙  9 *
2 +  6 [illegible]  0 △
3 ⊡  7 [illegible]
4 Y  8 ☆
```

Figure 3-7 MARK menu, selecting new mark shape

4) Select new shape by pressing appropriate numeral key. (If you want to change color but not shape, select same shape.) The prompt at the bottom of the menu asks you to select new color.

```
New Color?:
1 RED   5 PPL
2 YEL   6 BLU
3 GRN   7 WHT
4 CYN   0 No Change
```

Figure 3-8 MARK menu, selecting new mark color

5) Select color by pressing appropriate numeral key.

Displaying the Comment List

What appears on the comment list

When you attach a comment to a mark, the 188 sends the comment, mark position and mark shape to the comment list, where the mark is given the next sequential comment number. Note that the comment list also contains line commments.

Procedure

Press **MENU**, **3** and **5** to display the comment list.

```
1   34°44.210N 135°21.000E Y 93.04.10
2   34°12.341N 135°56.781E Y Miruzu Bay
3   34°44.212N 135°21.002E Y Sardine Catch
4   34°12.343N 135°56.783E Y Tuna 50T
5   34°44.214N 135°21.004E Y Herring  120T
6   34°44.215N 135°21.005E Y 93.05.01
7
8   34°44.216N 135°21.006E Y Mackerel
9   34°12.347N 135°56.787E Y Tuna 50T
10  34°44.218N 135°21.008E Y Tuna 120T
11  34°12.349N 135°56.789E Y 93.05.02
12  34°44.210N 135°21.000E — Amy Bay
13  34°12.341N 135°56.781E — 234M
14  34°44.212N 135°21.002E ◇ Crab
15  34°44.213N 135°21.003E * Shark
16  34°12.344N 135°56.784E * Sunken Vessel
17  34°44.215N 135°21.005E * Danger Point
18  34°12.346N 135°56.786E * Danger Point
19  34°44.217N 135°21.007E * Danger Point
20  34°12.348N 135°56.788E •
21  34°12.349N 135°56.789E •
22  34°44.210N 135°21.000E •
23  34°12.341N 135°56.781E •
24
25
26
27
28
29
30
```

```
MK Ent Mode: +Cursor
Color/Shape:  Red ◇
Line Type:
Mem Used:   22

MARK

5  Display Comment List

↑ ↓: Change Page
```

Figure 3-9 Sample comment list

Scrolling the list

Press [↑] and [↓] .

Displaying/Restoring Specific Marks

How to display specific marks

There may be times when you want to display only specific marks. You can do it by the following methods.

- by color(s)
- by time, and
- by shape(s).

When you are finished viewing specific marks you can completely or partially restore any marks temporarily erased.

Displaying specific marks

By color

1) Press **MENU**, **3**, **6** and **1**.

```
DISPLAY SPECIFIC MARK
1 By Color
---------------------
Dsp Color?
1 RED      5 PPL
2 YEL      6 BLU
3 GRN      7 WHT
4 CYN
```

Figure 3-10 Mark color selection menu

2) Select mark color you want to display. (You can select up to seven.) To display only the red, white and blue marks, for example, press **1**, **7**, **6** and **ENT**.

By time

1) Press **MENU**, **3**, **6** and **2**.

```
DISPLAY SPECIFIC MARK

2 By Time
---------------------
Enter starting Time:?


  _ _ Y _ _ M _ _ D
      _ _ : _ _
```

Figure 3-11 DISPLAY SPECIFIC MARK menu, by time

2) Enter starting time and date. Enter year by two digits for year and time by 24-hour notation in that order. If the date and time are April 10, 1993, 14:05, for example, press;

[9] [3] [0] [4] [1] [0]

[1] [4] [0] [5] [ENT]

3) Enter end time.

By shape

1) Press **MENU**, **3**, **6** and **3**.

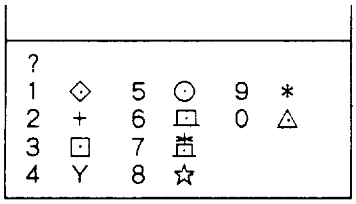


Figure 3-12 DISPLAY SPECIFIC MARK menu, by shape

2) Select shape to display. (You may select up to four.) To display only the triangle marks, for example, press **1** and **ENT**.

Restoring temporarily erased marks

The marks that you temporarily erased (in the previous section) can be restored, by doing the following.

1) Press **MENU**, **3**, **6** and **9**.
2) Select the item you want to restore.
3) Press **2** to restore item selected in step 2.

Auxiliary Marks

Introduction

This section shows how to turn the auxiliary marks on or off, on the plotter display.

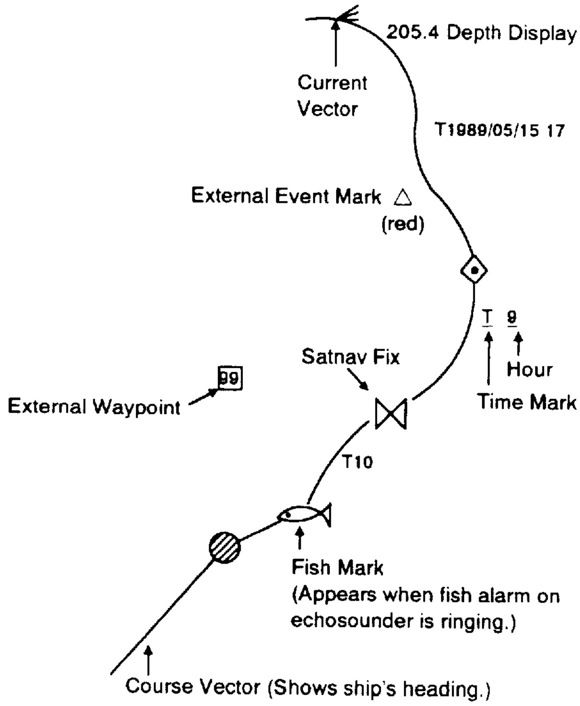


Figure 3-13 Auxiliary marks

Turning on/off

Comments (for marks, lines)

ON: [MENU] [9] [1] [2] [1] [1] [2]

OFF: [MENU] [9] [1] [2] [1] [1] [1]

External event marks (red triangle)

ON: [MENU] [9] [1] [2] [1] [2] [2]

OFF: [MENU] [9] [1] [2] [1] [2] [1]

Satnav fixes (input by Satellite Navigator)

ON: [MENU] [9] [1] [2] [1] [3] [2]

OFF: [MENU] [9] [1] [2] [1] [3] [1]

Time marks

OFF:	MENU	9	1	2	1	4	1
T mark only:	MENU	9	1	2	1	4	2
"T" & time:	MENU	9	1	2	1	4	3
"T", date & hour:	MENU	9	1	2	1	4	4

Water temperature or depth (input by temp/depth sensor)

OFF:	MENU	9	1	2	1	5	1
Temp:	MENU	9	1	2	1	5	2
Depth:	MENU	9	1	2	1	5	3

Course vector

ON:	MENU	9	1	2	1	6	2
OFF:	MENU	9	1	2	1	6	1

Current vectors (current data input by Current Indicator)

ON:	MENU	9	1	2	1	7	2
OFF:	MENU	9	1	2	1	7	1

Fish marks (input by echosounder)

ON:	MENU	9	1	2	1	8	2
OFF:	MENU	9	1	2	1	8	1

Changing Mark Pattern

Introduction

The shape of the ten standard marks may be changed to your liking.

Procedure

Change the shape of a mark as follows.

1) Press **MENU, 9, 1** and **0**.

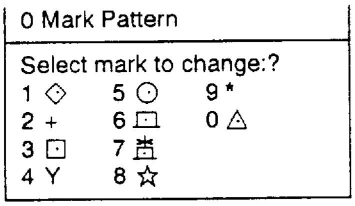


Figure 3-14 Selecting mark pattern to change

2) Enter mark number you want to change. For example, press **1** to change the shape of the triangle mark. Your display should look like Figure 3-15.

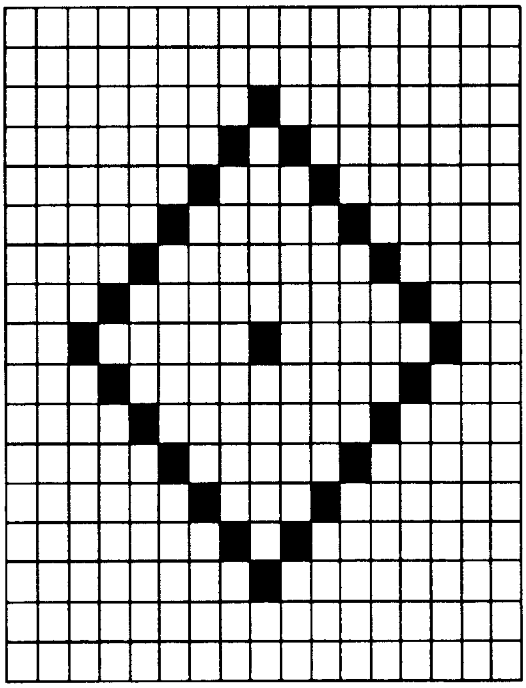


Figure 3-15 Display for changing shape of mark number 1

3) Operate the trackball to select bit to turn on or off and then press the **CHG** key.
4) Repeat step 3 to finish reshaping the mark to your liking.
5) Press **ENT**.

Radar Target Mark

A radar target mark ⊗ appears on the display when the target L/L data is fed from the radar connected. The following radars can output target L/L data (cursor position data); FR-1500 MARK-2 series, FR-2805 series and FR-2100 series.

LINES

This chapter teaches you how to process lines. Lines can be electrically drawn on the display to depict coastlines, danger areas, navigation lanes, etc.

Among the topics presented are how to

- enter lines by various methods
- change line attributes
- erase lines
- display the comment list, and
- display/restore specific lines.

Line Fundamentals

Line attributes

Lines can be drawn on the display in any combination of four line types and seven colors. The colors available appear on numeral keys 1 through 7. You can even draw each segment of a line in a different color and line type. To change line color, see page 1-14.

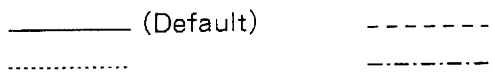


Figure 4-1 Line types

Comment for lines

You can attach a comment to a line for reference. The comment may consist of up to 12 alphanumeric characters. For how to attach a comment to a line, see page 1-15.

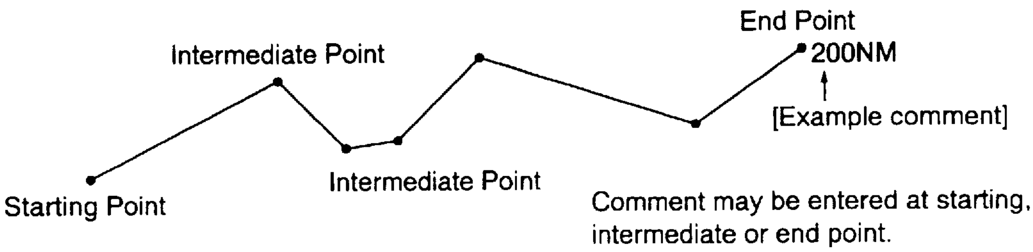


Figure 4-2 Sample line (with comment)

Methods of line entry

There are seven methods by which you can draw a line:

- by latitude and longitude coordinates
- by range and bearing from your ship
- by Loran C LOPs
- by Decca LOPs
- by ship's position
- by cursor, and
- by Loran A LOPs.

Entering Lines

Introduction

A line consists of a series of points: starting, intermediate and end.

As noted earlier there are seven methods by which you can enter a line. Entering a line by the cursor or your ship's position (depending on which is selected through the menu) offers the advantage of using the "LINE" keys; namely, direct keyboard input. Other methods are executed through the menu.

By latitude and longitude

Follow the procedure below to enter a line by latitude and longitude coordinates.

1) Press **MENU**, **4**, **0** and **1**.
2) Press **3**. A prompt asks you to enter latitude.
3) Enter latitude. To enter 34°44.125 minutes North latitude, for example;

   [3] [4] [4] [4]

   [1] [2] [5] ([CHG]) [ENT]

   (Press **CHG** *for South latitude, if necessary.)*

4) Enter longitude. For example, 135°21.345 East longitude.

   [1] [3] [5] [2] [1]

   [3] [4] [5] ([CHG]) [ENT]

5) Press **3**.
6) Enter latitude and longitude of next point. A line appears on the display. (If the line is not with in the current display area it does not appear.)
7) Repeat steps 5 and 6 to complete the lines.

By range and bearing from your ship

Follow the procedure below to draw a line using range and bearing from your ship.

1) Press **MENU**, **4**, **0** and **2**.
2) Press **3**.

3) Enter range (0 to 999.999 nautical miles) from your ship to starting point of line. For example, 12.5 nautical miles;

[0] [1] [2] [5] [0] [0] [ENT]

4) Enter bearing (0 to 360°). For example, 127.3°;

[1] [2] [7] [3] [ENT]

5) Press **3**.
6) Enter range and bearing of next point.
7) Repeat steps 5 and 6 to complete the line.

By Loran C LOPs

To enter a line by Loran C LOPs;

1) Press **MENU**, **4**, **0** and **3** to select Loran C LOPs.
2) Press **3**.
3) Enter starting point of the line.
   1. Enter GRI. For example, to enter 9970, press **9**, **9**, **7**, **0** and **ENT**.
   2. Enter LOPs (two), in any order. To enter 36371.3 and 59065.9;

      [3] [6] [3] [7] [1] [3] [ENT]

      [5] [9] [0] [6] [5] [9] [ENT]

   3. Enter estimated latitude and longitude position. To enter 34°44.12 minutes North latitude, 135°21.34 minutes East longitude;

      [3] [4] [4] [4]

      [1] [2] ([CHG]) [ENT]

      (Press **CHG** *for South latitude, if necessary.)*

      [1] [3] [5] [2] [1]

      [3] [4] ([CHG]) [ENT]

4) Repeat steps 2) and 3) to complete the line.

By Decca LOPs

The procedure which follows shows how to enter a line by Decca LOPs.

1) Press **MENU**, **4**, **0** and **4**.
2) Press **3**.
3) Enter starting point of line.

   1. Enter Decca chain in two digits. To enter chain 32, for example, press **3**, **2** and **ENT**.

      Enter LOPs (two), in any order, by using the following codes.

A = 1	B = 2	C = 3	D = 4	E = 5
F = 6	G = 7	H = 8	I = 9	J = 0

      To enter 1F22.00 and 1D35.01, for example;

      [1] [6] [2] [2] [0] [0] [ENT]

      [1] [4] [3] [5] [0] [1] [ENT]

   2. Enter estimated latitude of point. For example, 34°44 minutes North latitude.

      [3] [4] [4] [4] ([CHG]) [ENT]

      (Press **CHG** *for South latitude, if necessary.)*

   3. Enter estimated longitude of point. For example, 135°21 minutes East longitude.

      [1] [3] [5] [2] [1] ([CHG]) [ENT]

4) Repeat step 2) and 3) to complete the line.

By Loran A LOPs

To enter a line by Loran A LOPs;

1) Press **MENU**, **4**, **0** and **7** to select Loran A LOPs.
2) Press **3**. The prompt asks you to enter station pair.
3) Enter station pair and press **ENT**.
4) Enter two LOPs in any order.
5) Enter estimated latitude and longitude.
6) Repent steps 2-4 to complete the line.

Erasing Lines

How you can erase a line

You can erase lines collectively, individually, and partially (by segment).

Specific line

To erase a specific line;

1) Press **MENU**, **4** and **8**.
2) Press **1**. The prompt asks you to select the line you want to erase.
3) Operate the trackball to set the cursor on any point of the line.
4) Press **ENT**.
5) Press **2**.

All lines

Press **MENU**, **4**, **8**, **2** and **2** to erase all lines including those not shown on the display.

A segment of a line

To erase a segment of a line;

1) Set cursor on point of line you want to erase.
2) Press **CLR**. The line is reconnected.

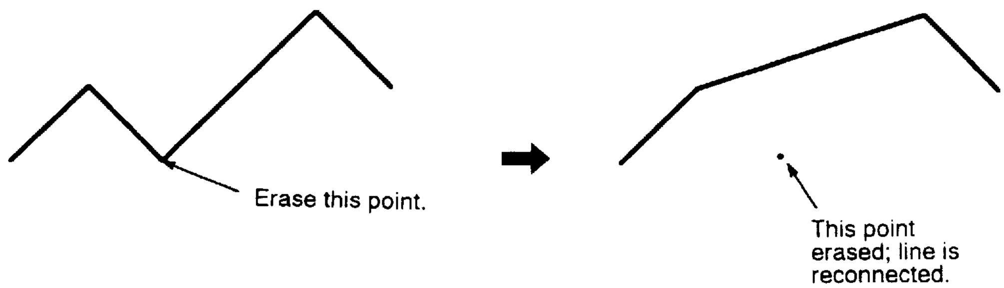


Figure 4-3 How a line is reconnected after erasing one of its segments

Changing Line Attributes

Introduction

You can change the color and line type of lines already entered. Note that you cannot change the attributes of individual segments on a line.

Procedure

To change line attributes;

1) Press **MENU**, **4** and **9**. The display prompts you to select a line.
2) Place the cursor on either the starting or end point of the line.
3) Press **ENT**.
4) Select new line type by pressing appropriate numeral key. For no change; namely, you want to change only line color, select same line type.
5) Select new color. For no change, press **0**.

Displaying the Comment List

What the comment list contains

When you attach a comment to a line, the 188 sends the comment, comment position and line color to the comment list, where the line is given the next sequential comment number.

Procedure

Press **MENU**, **4** and **5** to display the list. This list also stores mark comments (see page 3-9).

1	34°44.210N	135°21.000E	Y	93.04.10
2	34°12.341N	135°56.781E	Y	Miruzu Bay
3	34°44.212N	135°21.002E	Y	Sardine Catch
4	34°12.343N	135°56.783E	Y	Tuna 50T
5	34°44.214N	135°21.004E	Y	Herring 120T
6	34°44.215N	135°21.005E	Y	93.05.01
7				
8	34°44.216N	135°21.006E	Y	Mackerel
9	34°12.347N	135°56.787E	Y	Tuna 50T
10	34°44.218N	135°21.008E	Y	Tuna 120T
11	34°12.349N	135°56.789E	Y	93.05.02
12	34°44.210N	135°21.000E	–	Amy Bay
13	34°12.341N	135°56.781E	–	234M
14	34°44.212N	135°21.002E	◇	Crab
15	34°44.213N	135°21.003E	*	Shark
16	34°12.344N	135°56.784E	*	Sunken Vessel
17	34°44.215N	135°21.005E	*	Danger Point
18	34°12.346N	135°56.786E	*	Danger Point
19	34°44.217N	135°21.007E	*	Danger Point
20	34°12.348N	135°56.788E	•	
21	34°12.349N	135°56.789E	•	
22	34°44.210N	135°21.000E	•	
23	34°12.341N	135°56.781E	•	
24				
25				
26				
27				
28				
29				
30				

MK Ent Mode: +Cursor
Color/Shape: Red ◇
Line Type:

Mem Used: 22

MARK

5 Display Comment List

↑ ↓ : Change Page

Figure 4-4 Sample comment list

Scrolling the list

Press [↑] and [↓].

Displaying/Restoring Specific Lines

How to display specific lines

There may be times when you want to display only certain lines. You can do it by the following methods.

- by color(s)
- by time, and
- by line type(s).

When you are finished viewing specific lines you can completely or partially restore any lines temporarily erased.

Displaying specific lines

By color

1) Press **MENU**, **4**, **6** and **1**.

1 By Color	
Dsp Color?	
1 RED	5 PPL
2 YEL	6 BLU
3 GRN	7 WHT
4 CYN	

Figure 4-5 Line color selection menu

2) Select line color(s) you want to display. (You can select up to seven.) To display only the red, white and blue lines, for example, press **1**, **7**, **6** and **ENT**.

By time

1) Press **MENU**, **4**, **6** and **2**.
2) Enter starting time and date. Enter year by two digits for year and time by 24-hour notation in that order. If the date and time are April 10, 1993, 14:05, for example, press;

[9] [3] [0] [4] [1] [0]

[1] [4] [0] [5] [ENT]

3) Enter end time.

By line type

1) Press **MENU**, **4**, **6** and **3**.
2) Select line type to display. (You may select up to four.) To display only the solid line, for example, press **1** and **ENT**.

Restoring temporarily erased lines

The lines that you temporarily erased (in the previous section) can be restored as follows.

1) Press **MENU, 4, 6** and **9**.

```
Color □
Time 1993/ 9/ 1  0:00
        1995/ 9/ 1 13:01
LN Type: ——

CANCEL SELECTION

1 By Color
2 By Time
3 By Line Type

9 Cancel All
0 No Change

Enter Number:
```

Figure 4-6 CANCEL SELECTION menu

2) Select the item you want to restore.

3) Press **2** to restore item selected in step 2.

WAYPOINTS AND ROUTES

In navigation terminology, a particular location is known as a "**waypoint**," whether it be a starting point, a destination point or an intermediate point on a voyage.

A **route** is a sequence of waypoints leading to the ultimate destination.

This chapter covers the following subjects:

- entering waypoints by various methods
- displaying the waypoint list
- erasing waypoints
- creating and register routes
- following a route
- displaying the route list, and
- calculating the range and bearing between two points.

Waypoint Fundamentals

Waypoint storage capacity

This unit can store up to 194 waypoints on two pages. These pages are numbered 0 and 1 and each page stores 97 waypoints, numbered 00 to 97. Pages 0 and 1 are independent of one another. Therefore, you cannot use waypoints from both pages to create a route.

Special waypoints

- Waypoint "00" marks your ship's position when a destination waypoint is selected.
- Waypoint "98" denotes a destination waypoint set by the cursor.
- Waypoint "99" is an external waypoint where a "To" waypoint selected on the connected navigator is automatically stored.

Appearance of a waypoint

A waypoint is a yellow (default color), hollow octagon with waypoint number in the center. You can change waypoint color, but not waypoint shape.

Methods of waypoint entry

A waypoint can be entered

- by latitude and longitude coordinates (see page 1-16)
- by range and bearing from your ship
- by Loran C LOPs
- by Decca LOPs
- by ship's position
- by the cursor, and
- by Loran A LOPs.

■ **NOTE:** *A waypoint log is provided in the Appendix, for recording waypoints.*

Entering Waypoints

By cursor

Entering waypoint number and waypoint position

1) Press **MENU**, **5**, **0** and **6**.
2) Press **WPT ENTRY** or **2**. The prompts asks you to enter waypoint number.
3) Enter waypoint number (01 to 97). To enter waypoint 05, for example, press **0**, **5** and **ENT**.
4) Operate the trackball to set the cursor on the position desired for the waypoint and press **ENT**.

Entering a comment

Your display should now look like the left-hand figure in Figure 5-1, showing a set of upper case letters and symbols. You can also use lower case letters in a comment. The **CHG** key serves to switch between upper and lower case letter sets.

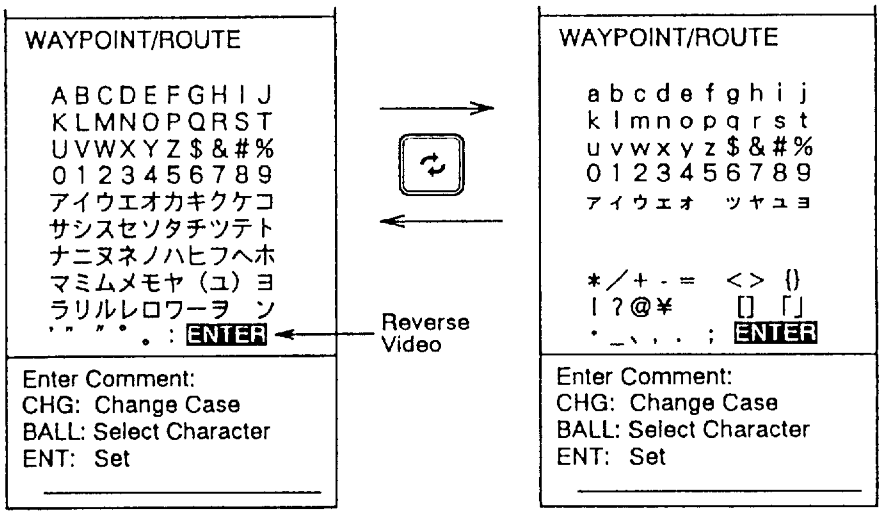


Figure 5-1 Characters available for comment

■ **NOTE:** *If you don't want to enter a comment now, press* **ENT** *to finish. In this case the unit assigns the youngest empty number. Waypoint comments can be freely changed through the waypoint list.*

5) Operate the trackball to select the first character of the comment you want to enter. Currently selected character appears in reverse video.
6) Press **ENT**. The character selected appears at the bottom of the menu.
7) Repeat steps 5 and 6 to complete the comment. A comment may contain up to 10 characters.

8) Operate the trackball to select "ENTER" and press **ENT**.
9) Press **MENU** twice to escape.

A yellow, hollow octagon with waypoint number inside marks a waypoint on the display. To enter another waypoint by the same method, return to step 2.

■ **NOTE:** *You can automatically enter a comment for a waypoint along with next consecutive number by pressing* **ENT** *after entering the waypoint. For example, the last-entered comment is "FURUNO". Then, to automatically attach the comment "FURUNO1" to the next waypoint you enter, you would press* **ENT** *directly after entering the waypoint.*

By remote control unit

To enter a waypoint by the remote control unit;

1) Press the **CHG** key to display the cursor.
2) Operate the cursor with the **Arrow** keys on the remote control unit to select location.
3) Press [#] to register the waypoint. The waypoint is assigned the youngest empty waypoint number.

You can enter a comment for the waypoint through the waypoint list.

At ship's position

To enter a waypoint at ship's position;

1) Press **MENU, 5, 0** and **5**.
2) Press **2**.
3) Enter waypoint number (01 to 97). To enter waypoint number, 06, for example, press **0, 6** and **ENT**. The waypoint appears at ship's position.
4) Enter comment, or press **ENT** to finish.

By range and bearing from your ship

This method is useful for denoting the location of a target found on radar.

1) Press **MENU, 5, 0** and **2**.
2) Press **2**.
3) Enter waypoint number in two digits.
4) Enter range (0 to 999.999) from your ship to point. For example, 15.2 nautical miles;

[0] [1] [5] [2] [0] [0] [ENT]

5) Enter bearing (0 to 360 degrees) to point. For example, 23.4 degrees;

[0] [2] [3] [4] [ENT]

6) Enter comment, or press **ENT** to finish.

By Loran C LOPs

To enter a waypoint by Loran C LOPs;

1) Press **MENU**, **5**, **0** and **3**.
2) Press **2**.
3) Enter waypoint number in two digits.
4) Enter four digit GRI code. For example, to enter chain 9970, press **9**, **9**, **7**, **0** and **ENT**.
5) Enter LOPs (two), in any order. To enter 36363.2 and 59101.5, for example;

[3] [6] [3] [6] [3] [2] [ENT]

[5] [9] [1] [0] [1] [5] [ENT]

6) Enter estimated latitude and longitude for LOPs. To enter 34°35 minutes North latitude, 135°00 minutes East longitude;

[3] [4] [3] [5] ([CHG]) [ENT]

[1] [3] [5] ([CHG]) [ENT]

(Press **CHG** *to switch coordinate, if necessary.)*

7) Enter comment, or press **ENT** to finish.

By Decca LOPs

The procedure which follows shows how to enter a waypoint by Decca LOPs.

1) Press **MENU**, **5**, **0** and **4**.
2) Press **2**.
3) Enter waypoint number in two digits.
4) Enter station code. To enter 35, for example, press **3**, **5** and **ENT**.
5) Enter LOPs (two), in any order, by using the following codes.

A = 1	B = 2	C = 3	D = 4	E = 5
F = 6	G = 7	H = 8	I = 9	J = 0

To enter 1A08.06 and 1J45.26, for example;

[1] [1] [0] [8] [0] [6] [ENT]

[1] [0] [4] [5] [2] [6] [ENT]

6) Enter estimated latitude and longitude coordinates for LOPs. For example, 34°45 minutes North Latitude, 132°00 minutes East longitude.

[3] [4] [4] [5] ([CHG]) [ENT]

[1] [3] [2] ([CHG]) [ENT]

(Press **CHG** *to switch coordinate, if necessary.)*

7) Enter comment, or press **ENT** to finish.

By Loran A LOPs

To enter a waypoint by Loran A LOPs;

1) Press **MENU**, **5**, **0** and **7** to select Loran A LOPs.
2) Press **3**. The prompt asks you to enter station pair.
3) Enter station pair and press **ENT**.
4) Enter two LOPs in any order.
5) Enter estimated latitude and longitude.
6) Enter comment, or press **ENT** to finish.

Changing Waypoint Page

Introduction

As noted earlier there are two pages in which you can enter a waypoint: page 0 and page 1. The default waypoint page number is 0. However, you can change to page 1, when page 0 becomes full, for example, by following the procedure below.

Procedure

To change waypoint page;

1) Press **MENU, 5** and **6**.

```
WPT Page No.: 0
---------------------
WAYPOINT/ROUTE

6  Select WPT Page
---------------------
Enter WPT Page No.:

        _     (0~1)
```

Figure 5-2 WAYPOINT/ROUTE menu, select waypoint page

2) Enter page number in one digit.

■ **NOTE** *You cannot change the page when a destination waypoint or route is selected for navigation. When you attempt to change the page in those instances an error message appears:*

"You cannot change WPT page when destination waypoint is selected."

"You cannot change WPT page during route navigation".

Displaying the Waypoint List

What is the waypoint list?

The waypoint list stores the position and comment for all waypoints.

Procedure

To display the waypoint list, press **MENU**, **5** and **4**.

```
00 34° 44.220N 135° 21.112E   NISHINOMIYA
01 34° 44.230N 135° 21.223E   NISHINOMIYA1
02 34° 44.270N 135° 21.145E   NISHINOMIYA2
03 34° 44.232N 135° 21.621E   KOBE
04 34° 44.211N 135° 18.752E   KOBE1
05 34° 44.233N 135° 18.365E   KOBE2
06 34° 44.256N 135° 18.615E   KOBE3
07 34° 44.245N 135° 19.265E   ASHIYA
08 34° 44.214N 135° 19.451E   ASHIYA1
09 --° --.---? ---° --.---?
10 --° --.---? ---° --.---?
11 --° --.---? ---° --.---?
12 34° 44.265N 135° 32.100E   OSAKA
13 34° 44.266N 135° 26.200E   OSAKA1
14 34° 44.233N 135° 21.306E   ABC
15 34° 44.215N 135° 21.505E   ABC1
16 34° 44.265N 135° 21.080E   ABC2
17 34° 44.212N 135° 54.721E   ABC3
18 34° 44.254N 135° 21.090E   AOBA
19 34° 44.265N 135° 23.604E   AOBA1
-20 34° 44.269N 135° 28.123E  AOKI
-21 34° 44.210N 135° 25.780E  MIYOSHI
-22 34° 44.210N 135° 21.650E  TAKIO
-23 34° 44.210N 135° 21.456E  TARACHI
24 --° --.---? ---° --.---?
```

```
WPT Page No.:      0

DISPLAY WPT LIST

1 Select WPT Page
2 Enter Waypoint
3 Enter Comment
4
5 Change WPT Number
6 Change WPT Color
7
8 Erase WPT
9
0

←↑ : Previous List
→↓ : Next List
```

Figure 5-3 Waypoint list

Scrolling the list

Press the **Arrow** keys.

Changing waypoint page

For page 0: Press **1**, **0** and **ENT**
For page 1: Press **1**, **1** and **ENT**.

To escape

Press **MENU** twice.

Changing Waypoint Color/Waypoint Number

Waypoint color

You can inscribe waypoints in one of seven colors. The colors available appear on numeral keys 1 through 7. The default waypoint color is yellow.

Future waypoints

To change color of future waypoints;

1) Press **MENU, 5** and **8**.
2) Select color by pressing appropriate numeral key. For example, press **1** to display future waypoints in red.

Past waypoints

You can change the color of waypoints already entered, through the waypoint list.

1) Press **MENU, 5, 4** and **6**.
2) Enter waypoint number in two digits.
3) Select color by pressing appropriate numeral key.

Changing Waypoint Number

To change waypoint number;

1) Press **MENU, 5, 4** and **5**. You are asked to enter waypoint number.
2) Enter waypoint number in two digits. For example, press **0, 1** and **ENT** for waypoint 01.
3) Enter new number. For example, press **0, 9** and **ENT** to change waypoint number to 09. Using the above examples, the waypoint data of waypoint 01 is moved to 09.

   NOTE: If the waypoint is used, you are asked if it is alright to overwrite its data. Press **2** to overwrite the data, or **1** to enter different number.

Hiding/Showing Specific Waypoints

Hiding

To hide a waypoint;

1) Press **MENU**, **5**, **4** and **2**.
2) Press the **CHG** key and enter waypoint number.
3) Press **ENT** twice. A minus sign appears next to the waypoint number in the waypoint list.

Showing

Enter waypoint as above except omit pressing the **CHG** key.

Erasing Waypoints Through the Waypoint List

Introduction

There are two ways to erase waypoints: by using the cursor and the **CLR** key or through the waypoint list.

Procedure

Follow the procedure below to erase waypoints through the waypoint list.

1) Press **MENU, 5, 4** and **8**.
2) Enter waypoint number in two digits and then press **ENT**.
3) Press **2**.

■ **NOTE:** *A waypoint cannot be erased if it is currently selected as a destination waypoint or is part of a route. When you try to erase a waypoint in those situations an error message appears:*

"You cannot erase waypoint selected as destination waypoint".
"Cannot erase waypoint which is part of a route".

Setting/Cancelling a Destination Waypoint

What is a destination waypoint?

A destination waypoint is a single waypoint from which you want to proceed from present position. When you set a destination waypoint the unit computes range and bearing from a position to the waypoint and shows ideal course.

Setting by waypoint number

In an earlier chapter you learned how to set a destination waypoint from present position to a waypoint. This section shows you how to do it by two waypoints.

1) Press **MENU, 5, 1** and **1**. (Same as pressing **WPT ENTRY.**)

```
WAYPOINT/ROUTE

1 Select WPT/Route
-------------------------
Enter FROM/TO Waypoints:
                 _ _ → _ _
Ship Pos:      00
+Cursor        98
Ext WPT Pos:   99
```

Figure 5-4 WAYPOINT/ROUTE menu, select WPT/Route

2) Enter starting and destination waypoint numbers in two digits each and then press **ENT**. The starting and destination waypoint numbers are connected on the display with a light-blue line. This line shows ideal course.

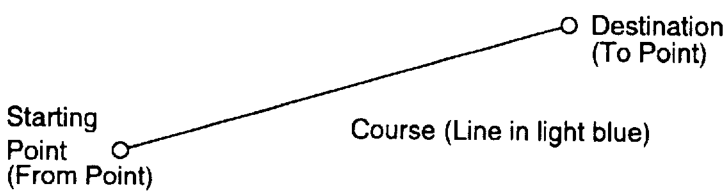


Figure 5-5 Destination set using two waypoints

Cancelling

Press **CANCEL WPT.**

Registering Routes

What is a route?

In many cases a trip from one place to another involves several course changes, requiring a series of route points (waypoints) which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a **route**. This unit can automatically advance to the next waypoint on a route, so you do not have to change the destination waypoint repeatedly.

■ **CAUTION:** *The route planning function is a very useful and beneficial function to have available. However, the ability to switch waypoints automatically during a voyage can lead to some very dangerous situations. The use of any navigational aid requires constant exercise of common sense and caution.*

Route storage capacity

The 188 can store up to 10 routes, numbered 01 to 10. A route may contain up to 10 waypoints. Be sure to record all important routes in a separate log and record them onto a memory card or floppy disk. This unit is not a fail-safe record keeping device.

How to register a route

You create a route by entering latitude and longitude of each route waypoint, either automatically by previously registered waypoint or manually. Note that you cannot create a route using waypoints on different waypoint page numbers.

1) Select waypoint page number.

For page 0: [MENU] [5] [6] [0] [ENT]

For page 1: [MENU] [5] [6] [1] [ENT]

2) Press **MENU, 5** and **3**. The prompt asks for route number.
3) Enter route number; for example, route 02. Press **0, 2** and **ENT**. The display shown in Figure 5-6 appears and you are asked to enter a comment.

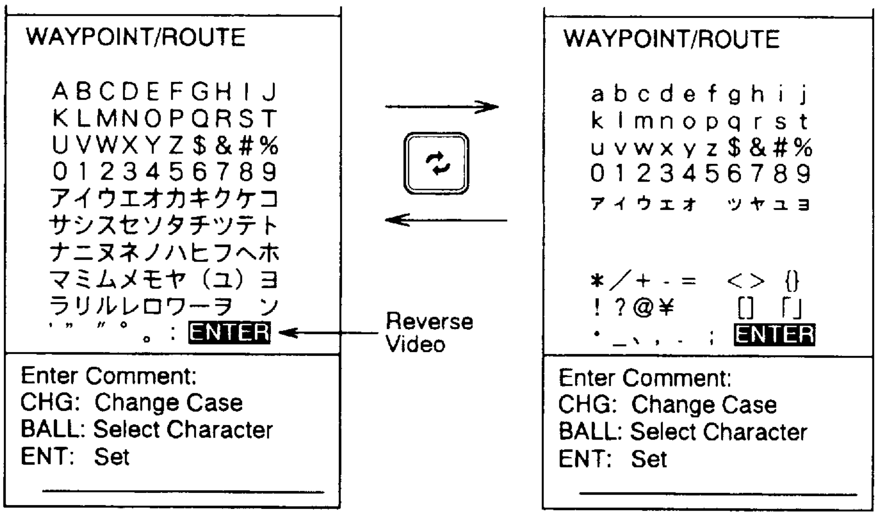


Figure 5-6 Alphanumeric characters available for use in comment for route

4) Operate the trackball to select first character of comment and then press **ENT**. Repeat this procedure to complete the comment. The comment may consist of up to 10 alphanumeric characters.

5) Operate the trackball to set the cursor on "ENTER" and press **ENT**. You are asked to enter waypoint number.

6) Enter waypoint numbers in order in which they are to be navigated.

[0] [5] [ENT]

[1] [1] [ENT]

[1] [2] [ENT]

For example, enter (registered) waypoints 05, 11, 12

[1] [3]

13 is not a registered waypoint; below is an example position for waypoint 13.

[3] [5] [4] [4] [4] [4] [4] ([CHG]) [ENT]

[1] [3] [5] [2] [1] [1] [1] [2] ([CHG]) [ENT]

(Press **CHG** *to switch coordinate, if necessary.)*

7) Press **MENU** twice to return the plotter display.

Following/Cancelling a Route

What happens when you follow a route

Following a route is the process by which you use a stored route or cursor-created route for navigation. This unit displays navigation information to guide you from one waypoint to the next, as it automatically switches from waypoint to another in sequence.

Setting waypoint change range

The waypoint change range is the distance from which your vessel is from a route waypoint when the 188 switches to the next waypoint. You can set it as follows:

1) Press **MENU**, **5**, **7** and **1**. The prompt asks you to enter waypoint change range (in nautical miles).

```
7 Set WPT Change Rng
---------------------
Enter Range from WPT.

      _ _ . _ _ NM
```

Figure 5-7 Prompt to enter waypoint change range

2) Enter range. If you want the unit to change to next intermediate waypoint when you are 0.5 nautical miles from an intermediate waypoint, for example, press **0**, **0**, **5** and **ENT**.

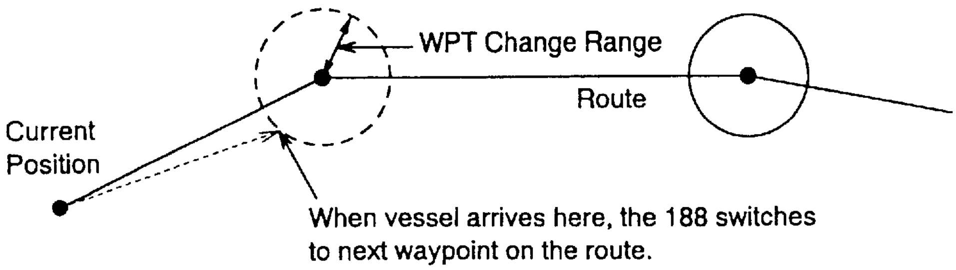


Figure 5-8 Graphic interpretation of waypoint change range

Following a route

There are three methods by which you can select a route to follow:

- by two waypoints (mentioned on page 5-10)
- by registered route, and
- by cursor

By registered route

To follow a registered route;

1) Set waypoint change range if necessary.

2) Press **MENU, 5, 1** and **2**. The unit asks you to enter route number.

3) Enter route number(s) in two digits and then press **ENT**. You may enter up to five routes.

If you want to traverse the route in the apposite direction, press **CHG** before entering route number.

A light-blue dashed line connects route waypoints.

By cursor

You can manually enter up to 10 route points by using the cursor.

1) Set waypoint change range if necessary.
2) Press **MENU, 5, 1** and **3**.
3) Operate the trackball to select first route point and then press the **CHG** key. A yellow flag appears.
4) Repeat step 3 to enter other route points.
5) Press **ENT**.

Yellow flags mark route points and they are connected by a light-blue dashed line.



Figure 5-9 Route created by using the cursor

Cancelling a route

Press **CANCEL WPT**.

Skipping Route Waypoints

During route navigation

In Figure 5-10, for example, waypoint 4 is skipped because the vessel is heading for waypoint 3.

Press **MENU**, **5**, **7**, **2** and **2**. Route waypoints are reconnected deleting waypoint skipped.

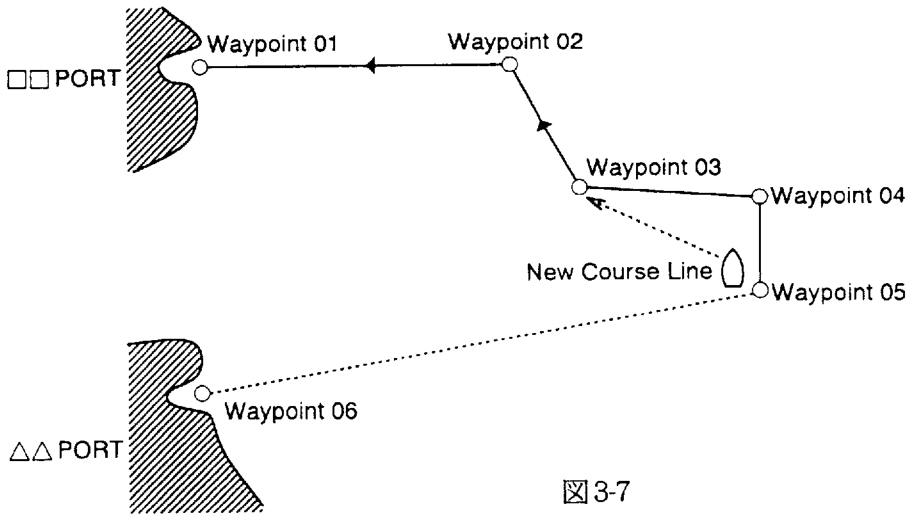


Figure 5-10 A route where waypoint 4 is skipped

Inactive route

A route waypoint may be skipped by entering a minus sign (–) to the left of the route waypoint.

1) Press **MENU**, **5** and **3**.
2) Enter route number in two digits and press **ENT**.
3) Press **1** or **2**.
4) Select waypoint to skip by pressing [↑]/[↓].
5) Press the **CHG** key and then enter waypoint number. Press **ENT**.
6) Press **MENU** twice to return to the plotter display.

When you want to restore a point, enter the waypoint number as above except without the minus sign.

Replacing/Deleting Route

Replacing a route waypoint

To replace a route waypoint;

1) Press **MENU**, **5** and **3**.
2) Enter route number in two digits and press **ENT**.
3) Press **1** or **2**.
4) Select waypoint to replace by pressing [↑]/[↓].
5) Enter new waypoint number.
6) Press **MENU** twice to return to the plotter display.

Deleting route

When you no longer need a route you can erase its contents.

1) Press **MENU**, **5** and **3**.
2) Enter route number in two digits and press **ENT**.
3) Press **1** and **ENT**.
4) Press **0**, **0** and **ENT**.

Displaying the Route List

What is the route list?

The route list stores route information for each route entered. The route list also functions to calculate time-to-go from current position to destination waypoint in a route.

How to display the route list and get time-to-go

To display the route list;

1) Press **MENU, 5** and **5**. The unit asks you to enter route number.

```
DISPLAY ROUTE LIST
------------------
Enter Route No.:

  _ _   (01~10)
```

Figure 5-11 Prompt for entering route number

2) Enter route number in two digits and then press **ENT**. A prompt asks you to enter trial ship's speed.

```
WPT Page No.:              0
02  FURUNO
Total Dist.:        987.6 NM
Time-To-Go:      00D:00H:00M
Trial Speed:          0.0 KT
----------------------------
DISPLAY ROUTE LIST

76 34° 44. 987N135° 20. 123E
65 34° 43. 876N135° 21. 234E
54 34° 42. 765N135° 22. 345E
43 34° 41. 654N135° 23. 456E
32 34° 40. 543N135° 24. 567E
21 34° 39. 432N135° 25. 678E
10 34° 38. 321N135° 26. 789E
09 34° 37. 210N135° 27. 890E
98 34° 36. 109N135° 28. 901E
87 34° 35. 098N135° 29. 012E
----------------------------
To show other route
list, press ESC key
and enter route number.

Trial Speed? _ _ ._ KT
```

Figure 5-12 Sample route list

3) Enter ship's speed to be used for the calculation. If it is 12.3 knots, for example, press **1**, **2**, **3** and **ENT**.

   The results appear at the top of the display.

4) Press **ESC** to view the contents of another route, or **MENU** twice to return to the plotter display.

Calculating Range and Bearing Between Two Points

By two waypoints

Follow the procedure below to calculate the range and bearing between two waypoints.

1) Press **MENU**, **9**, **4** and **3**.
2) Enter starting and end waypoint numbers. To calculate the range and bearing between waypoints 01 and 02, for example, press **0**, **1**, **0**, **2** and **ENT**. The results appear at the top of the display.

By cursor

You can calculate the range and bearing between two waypoints selected by the cursor.

1) Press **MENU**, **9**, **4** and **2**.
2) Operate the trackball to set the cursor on starting point and then press **ENT**.
3) Operate trackball to set cursor on end point and then press **ENT**.

By latitude and longitude

To calculate the range and bearing between two pairs of latitude and longitude coordinates;

1) Press **MENU**, **9**, **4** and **1**.
2) Enter latitude and longitude of starting point. To enter 34°44.456 North latitude, 135°21.234 East longitude;

[3] [4] [4] [4] [4] [5] [6] ([CHG]) [ENT]

[1] [3] [5] [2] [1] [2] [3] [4] [CHG] [ENT]

(Press **CHG** *to switch coordinate, if necessary.)*

3) Enter latitude and longitude of end point.

ALARMS

The 188 comes equipped with eleven types of alarms. This chapter tells you how to set and disable the alarms.

■ **NOTE:** *Several alarms are useful for alerting you to possibly dangerous situations. However, the captain is always responsible for the safe operation of his ship. FURUNO Electric Company will not assume responsibility for any damages associated with the use of the alarms.*

Alarm Fundamentals

Types of alarms

There are eleven conditions which can trigger the audible and visual alarms:

- The **Arrival** alarm tells you that you are near a destination waypoint.
- The **Anchor Watch** alarm warns that your ship may be dragging its anchor.
- The **XTE** (cross track error) alarm sounds when the cross-track error exceeds a predetermined value.
- The **Border** alarm notifies you when your ship is approaching an area you do not want to avoid.
- The **Target Proximity** alarm warns that you are approaching too close to a target point mark.
- The **Water Temperature** alarm sounds when the water temperature goes higher or lower than the predetermined value, or when it exceeds a predetermined value for more than one minute.
- The **Water Depth** alarm tells you the water depth is higher or lower than the predetermined value.
- The **Current** alarm lets you know when the current (tide) speed of a current layer is higher or lower than the preset speed.
- The **Ship's Speed** alarm sounds when the ship's speed is higher or lower than present speed, or is out of a preset range.
- The **Wake-up** alarm works like an alarm clock.
- The **Timer** alarm counts down time, sounding the alarm when time set has elapsed.

When an alarm setting is exceeded

When an alarm setting is exceeded the audible alarm sounds and the alarm violation icon (speaker) appears on the display.

Silencing the audible alarm

Press **CLR**.

Arrival and Anchor Watch Alarms

Description

Arrival alarm

The arrival alarm warns you that your ship is approaching a destination waypoint. The area that defines an arrival zone is that of a circle which you approach from outside the circle. The alarm will be released if your ship enters into the circle.

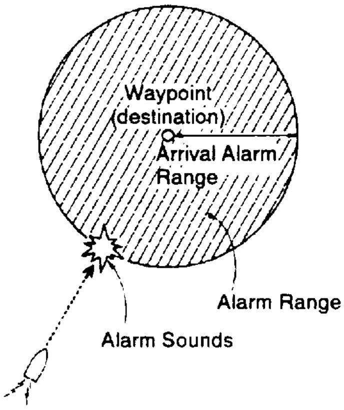


Figure 6-1 Condition which releases the arrival alarm

Anchor watch alarm

The anchor watch alarm sounds to warn that your ship is moving when it should be at rest.

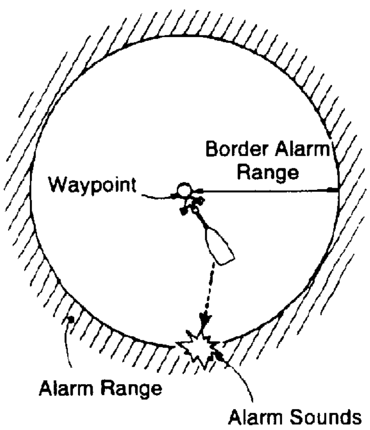


Figure 6-2 How the anchor watch alarm works

■ **NOTE:** *The arrival and anchor watch alarms cannot be turned on together.*

Setting the arrival alarm

To set an arrival alarm limit of 0.1 nautical miles from your ship's position to a destination waypoint, for example, do the following:

1) Set the destination waypoint by pressing;

[MENU] [5] [1] [1]

[0] [0] [*X] [*X] [ENT]

X = destination waypoint number

2) Press **MENU**, **7**, **1** and **2**.
3) Set the alarm range. For example, press, **0**, **0**, **1**, **0** and **ENT**.

Setting the anchor watch alarm

To set an anchor watch of 0.05 nautical miles about your ship's position, for example, do the following:

1) Set waypoint number by pressing;

[MENU] [5] [1] [1]

[0] [0] [*X] [*X] [ENT]

(X = waypoint number)

■ **NOTE:** *To set the alarm about own ship, set the cursor on own ship's position and then press* **0**, **0**, **9** *and* **8**.

2) Press **MENU**, **7**, **1** and **3**.
3) Enter alarm range, from 0.01 to 99.99 nautical miles. To enter 0.5 nautical miles, press **0**, **0**, **0**, **5** and **ENT**.

Disabling the arrival/anchor watch alarm

To disable the arrival alarm or anchor watch alarm (whichever is active);

1) Press **MENU**, **7** and **1**.
2) Press **1** to disable the active alarm.

XTE and Border Alarms

Description

XTE alarm

The XTE alarm alerts you when your ship strays from its intended course. You may preset the alarm limit from 0.01 nautical miles to a maximum lane width of 99.99 nautical miles. The audible and visual alarms will be released if your ship goes out of the lane limits.

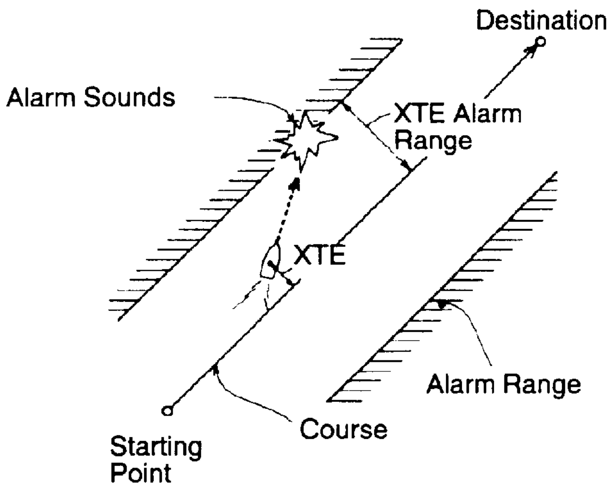


Figure 6-3 Condition which causes the release of the XTE alarm

Border alarm

The border alarm defines an area, defined by two waypoints, which you do not want to cross. The alarm will sound when your ship crosses the area defined by the two waypoints.

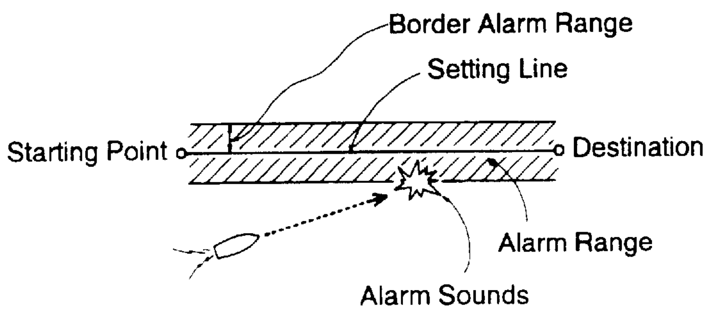


Figure 6-4 How the border alarm works

■ **NOTE:** *The XTE and border alarms cannot be turned on together.*

Setting the XTE alarm

To set a cross track error limit of two nautical miles between ship's position and a destination waypoint, for example;

1) Press the following keys to set destination waypoint.

MENU | 5 | 1 | 1

0 | 0 | *X | *X | ENT

(X = destination waypoint number)

2) Press **MENU, 7, 2** and **2**.
3) Enter the alarm range (0.01 to 99.99 nautical miles). For example, press **0, 0, 2, 0** and **ENT** for two nautical miles range.

Alarm range shown on display

A pair of solid red lines mark XTE alarm range.

Setting the border alarm

Set the border alarm as follows.

1) Press;

MENU | 5 | 1 | 1

X* | X* | Y* | Y* | ENT

X = starting waypoint number, Y = end waypoint number

2) Press **MENU, 7, 2** and **3**.
3) Enter alarm range, for example, two nautical miles. Press **0, 2, 0, 0** and **ENT**.

Alarm range shown on display

A pair of solid red lines mark border alarm range.

Disabling the XTE/border alarm

You may disable the active alarm by pressing **MENU, 7, 2** and **1**.

Target Proximity Alarm

Description

In Chapter 3 you learned how to enter a target point mark. Using target point marks you have entered, the 188 can release alarms if your ship moves within a distance you specify from all target points. A good example of a target point would be a wreck.

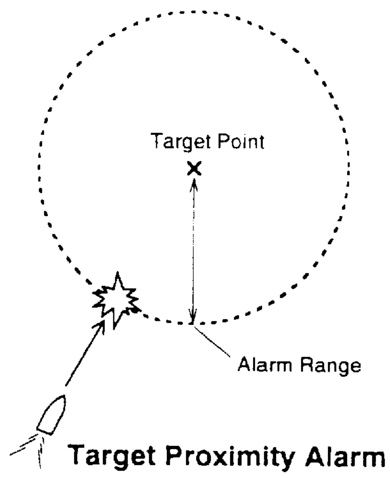


Figure 6-5 How the target proximity alarm works

Setting

To set the target proximity alarm;

1) Enter target point(s) by pressing **MENU**, **9**, **6**, **1** (enter target number) and **3** (enter location).
2) Press **MENU**, **7**, **3** and **2**. The prompt asks you to enter alarm range.
3) Enter an alarm range from 0.01 to 99.99 nautical miles. If the alarm range is 0.02 nautical miles, for example, press **0**, **0**, **0**, **2** and **ENT**.

Disabling

Press **MENU**, **7**, **3** and **1**.

Water Temperature Alarm

Description

All fish species have their respective habitable water temperature range. If the water temperature of the area you are in is far out of the habitable temperature range for a target fish, you can hardly expect a good catch. The 188 can alert you to changes in water temperature, by using water temperature data fed from an external water temperature sensor.

Types of alarms

The 188 can release the water temperature alarm in one of three conditions:

- when the water temperature is higher than the preset temperature
- when the water temperature is lower than the preset temperature, or
- when the present temperature is higher or lower than the last sampled reference. This is called the current rip alarm.

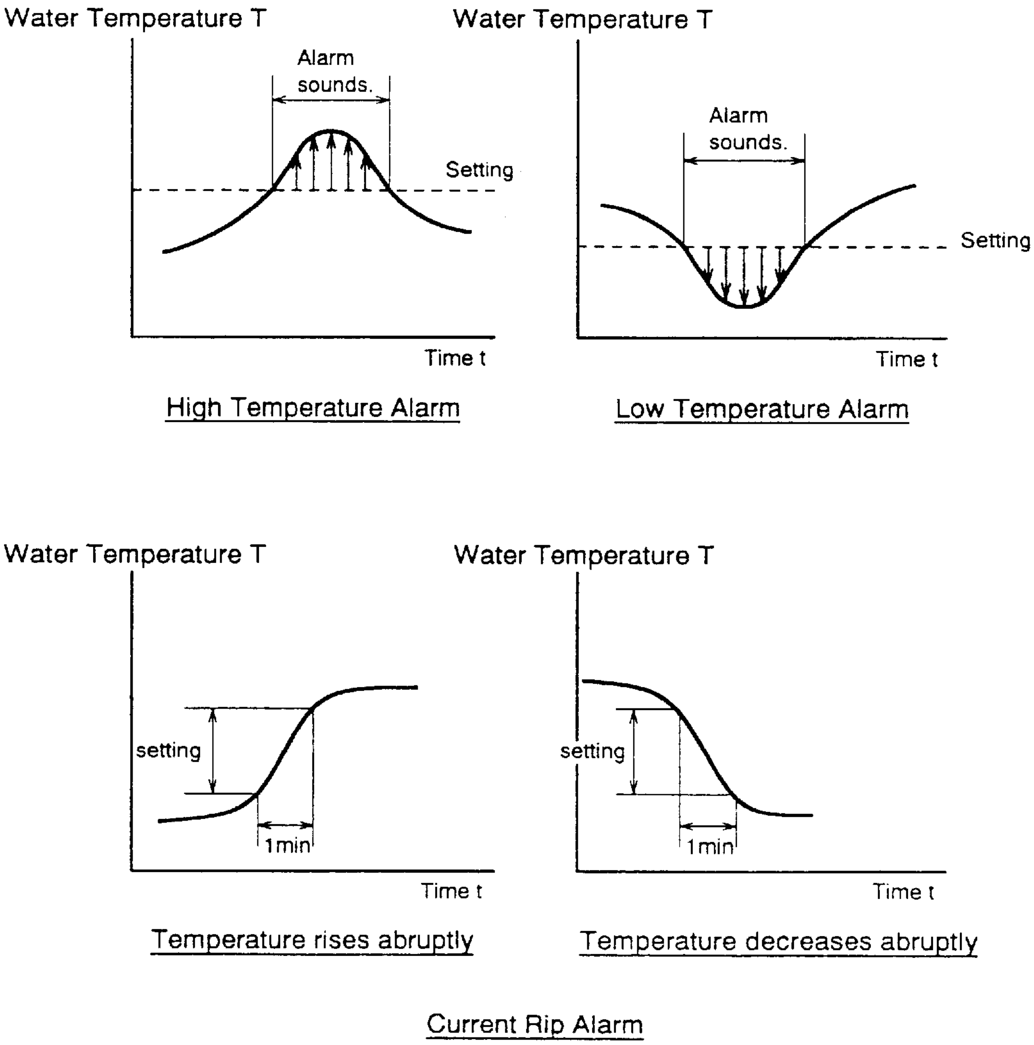


Figure 6-6 How the water temperature alarms work

Current rip alarm

The current rip alarm warns you when the present temperature is higher or lower than the last sampled reference by more than the one you have set. Current rips, caused along sea stream and currents or at their junction, often gather dense fish shoals.

Setting

Set the water temperature alarm as follows.

1) Press **MENU**, **7** and **4**.

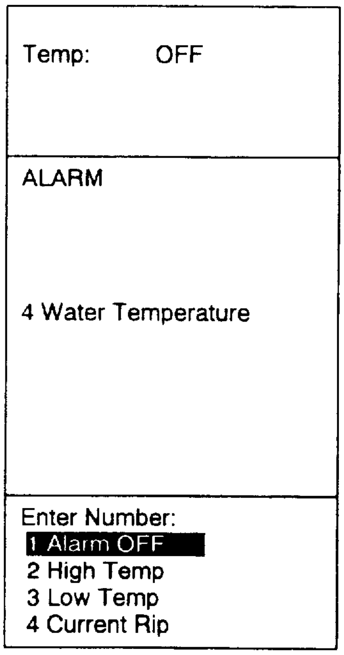


Figure 6-7 ALARM menu, water temperature

2) Select alarm type;
   - **2** for High temperature
   - **3** for Low temperature, or
   - **4** for Current Rip.
3) Enter water temperature range (-99.9°C to 99.9°C). To enter 10°C, for example, press **1**, **0**, **0** and **ENT**. (For minus temperature, press the **CHG** key before entering temperature.)

Disabling

Press **MENU**, **7**, **4** and **1**.

Water Depth Alarm

Description

The water depth alarm, depending on alarm type selected, alerts the operator when the water depth is shallower or deeper than the preset value. The water depth alarm can be thought of as a zone extending from the transducer down to a depth of water greater than the draft of your ship. In waters where the depth is known to dramatically and suddenly rise without warning, it may be a good idea to set the depth alarm 10 (or even 20) feet below your ship's draft to warn of impending danger. This alarm functions only when depth information is fed to this unit.

Setting

To set the water depth alarm;

1) Press **MENU**, **7** and **5**.

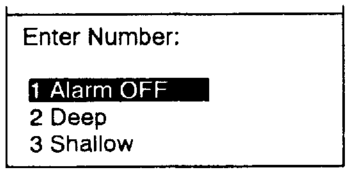


Figure 6-8 Turning water depth alarm on or off

2) Select alarm type. Press **2** for deep, or **3** for shallow.
3) Set depth which causes the alarm (0 to 3,000.0 meters). To set 105 meters, for example, press **0**, **1**, **0**, **5** and **ENT**.

Disabling

Press **MENU**, **7**, **5** and **1**.

Current Alarm

Description

The current alarm requires current indicator data input to function. It sounds when the speed of the current layer selected is higher or lower than the preset current speed, depending on alarm type selected.

Setting

Set the current alarm as follows.

1) Press **MENU, 7** and **6**.

```
Enter Number:
1 Alarm OFF
2 High
3 Low
4 Select Layer
```

Figure 6-9 Turning current alarm on or off

2) Select alarm type. Press **2** for high, or **3** for low.
3) Enter speed which triggers the alarm (0 to 99.9 knots). To enter, 1.2 knots, for example, press **0**, **1**, **2** and **ENT**.
4) Press **6** and **4**. The prompt asks you to select current layer.
5) Enter layer (1 to 3) in one digit and press **ENT**. The current speed and direction of layer selected appears on the plotter display.

Disabling

Press **MENU**, **7**, **6** and **1**.

Ship's Speed Alarm

Description

This alarm uses ship's speed data fed from the main navigator to release the alarms when the ship's speed is higher or lower than the preset speed, or out of a preset speed range.

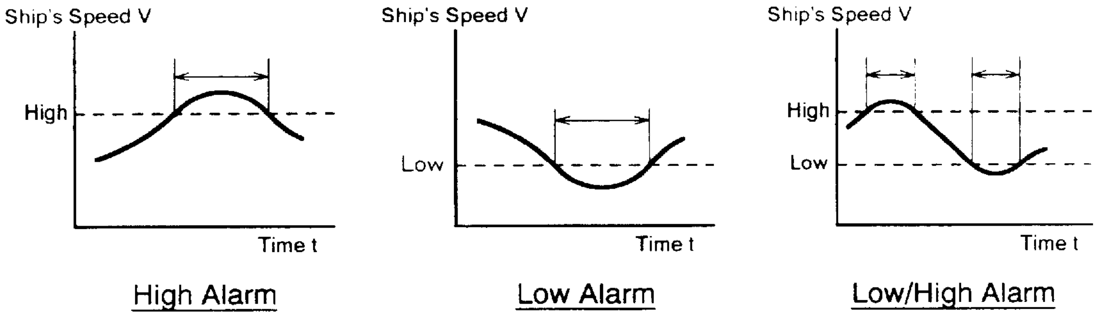


Figure 6-10 How the ship's speed alarms work

Setting

The procedure which follows shows how to set the ship's speed alarm.

1) Press **MENU**, **7** and **7**.
2) Select alarm type. Press
   - **2** for High
   - **3** for Low, or
   - **4** for Low/High

3) Enter speed from 0.1 to 99.9 nautical miles.

   Example 1 (High alarm): Alarm sounds when ship's speed is higher than 18 knots.

   1 **8** **0** **ENT**

   Example 2 (Low alarm): Alarm sounds when ship's speed is lower than 5 knots.

   0 **5** **0** **ENT**

Disabling

Press **MENU**, **7**, **7** and **1**.

Wake-up Alarm/Timer Alarm

Wake up Alarm

This alarm works just like an alarm clock, ringing when the preset time arrives. The time set appears at the top of the ALARM/Wake-up Alarm menu.

Setting

To set the wake-up alarm;

1) Press **MENU**, **7**, **8** and **2**.
2) Enter time you want the alarm, in 24-hour notation. To get the alarm at 6:00 a.m., for example, press **0**, **6**, **0**, **0** and **ENT**.

Disabling

Press **MENU**, **7**, **8** and **1**.

Timer Alarm

This timer alarm counts down time, releasing the audible and visual alarms when the preset time has elapsed. The time set appears at the top of the ALARM/Timer menu.

Setting

Set the elapsed time alarm as follows.

1) Press **MENU**, **7** and **9**.
2) Select alarm type. Press **2** for one-time count down, or **3** for repeated count down with audible alarm at every terminal count.
3) Enter time in 24-hour notation. For example, to get the alarm after two hours and thirty minutes has elapsed (one-time count down) or every two hours and thirty minutes (repeated), press **0**, **2**, **3**, **0** and **ENT**.

Disabling

Press **MENU**, **7**, **9** and **1**.

Confirming the Alarm Type

When several alarms are active and the audible alarm sounds you will not know which alarm has been exceeded. You can confirm which alarm(s) is sounding by pressing **MENU**, **7** and **0** to display the ALARM CONFIRMATION display.

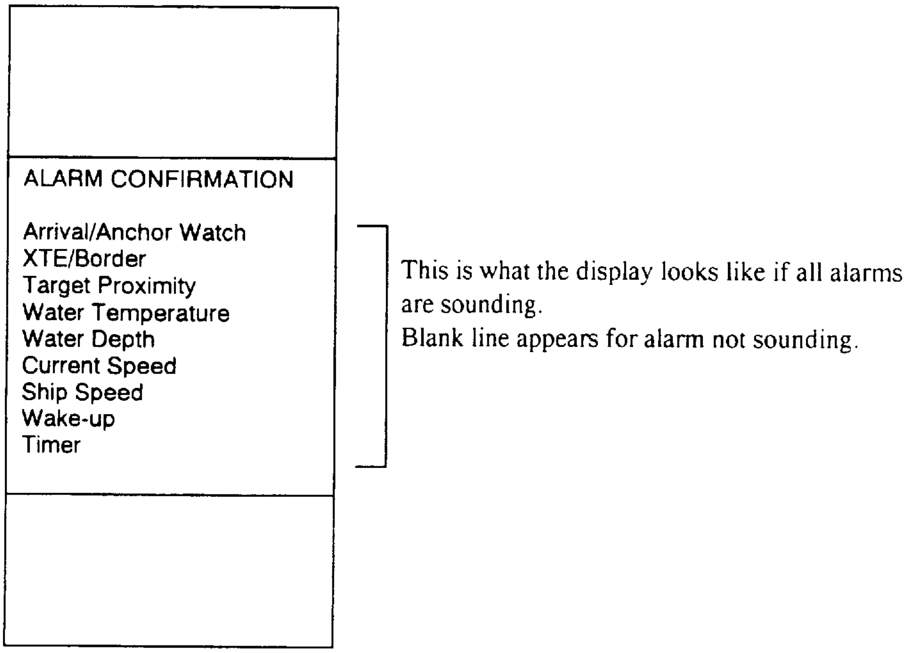


Figure 6-11 ALARM CONFIRMATION display

RECORDING AND REPLAYING DATA

This chapter mostly covers the recording and replaying of data by floppy disk and memory card.

You will learn how to

- format a floppy disk and memory card
- record data
- replay data
- copy data
- log data automatically
- display an electronic chart stored on a floppy disk
- confirm free memory space on a medium, and
- delete files.

Data Recording and Memories

Where you can record data

The 188 has three locations in which you can record data:

- floppy disk
- memory card, and
- file memory (internal memory).

File memory

The file memory stores data for later copying or replaying.

Working memory

The working memory stores position, marks, lines, waypoints, water temperature data, depth data, etc. When it is full earliest data are erased one by one to make room for new data.

Memory configuration

Figure 7-1 shows the memory configuration of the 188.

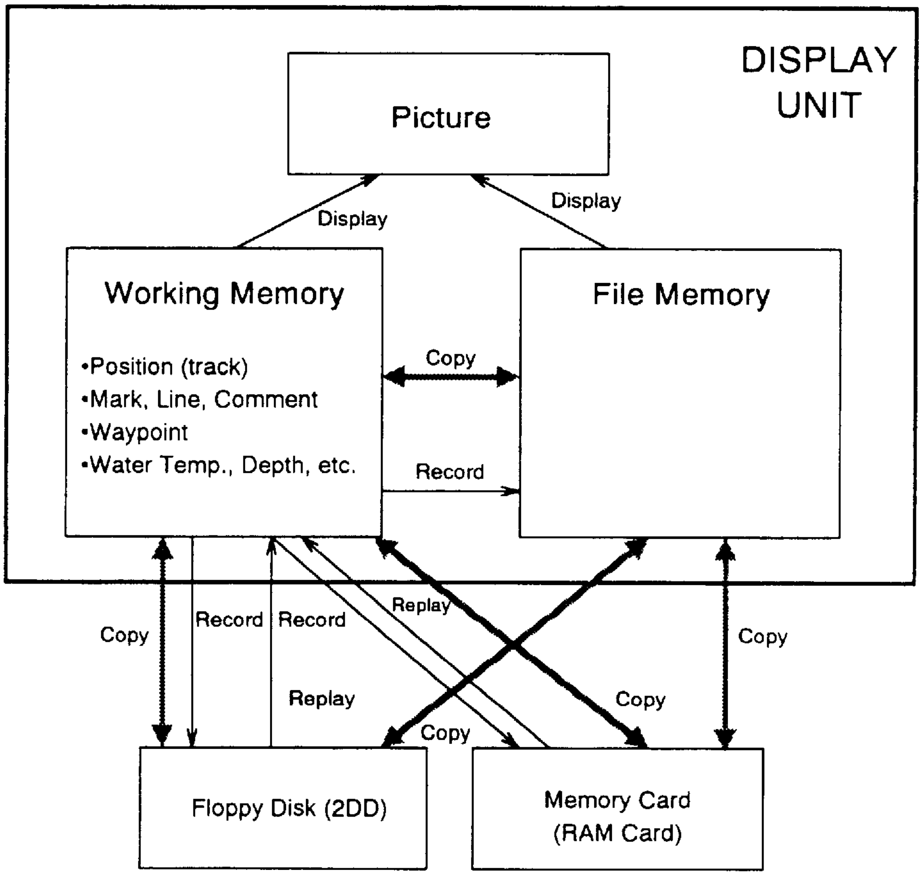


Figure 7-1 Memory configuration

Formatting a Floppy Disk, Memory Card

What is formatting?

Before you can use a floppy disk or memory card it must be formatted. Formatting prepares the disk or card for use with the system.

Procedure

To format a floppy disk or memory card;

1) Take a brand-new floppy disk or memory card from its protective case and insert it into the proper drive.
2) Press **MENU**, **8** and **9**.
3) Select medium by entering appropriate numeral key; **1** for floppy disk, or **2** for memory card. (Select file memory if you want to clear the file memory.)
4) Press **2**.

■ **NOTE:** *It takes a few seconds to format a memory card, and about one minute to format a floppy disk.*

Recording Data

Introduction

This section shows you to record data in the working memory to the file memory, floppy disk or memory card. Note that you cannot record (copy) an electronic chart.

Recording data to a new file

Follow the procedure below to record data to a new file.

1) Insert floppy disk or memory card in proper drive.
2) Press **MENU**, **8** and **1**. The prompt asks you to select a medium.
3) Select where you want to record data; floppy disk, memory card or file memory.
4) Select the data you want to record;
   - 1) main track
   - 2) sub track
   - 3) mark/line
   - 4) waypoint/route
   - 5) target point, or
   - 6) all

   To record main track, mark/line, and waypoint/route, for example, press **1**, **3**, **4** and **ENT**.
5) Confirm that "Make New File" appears in reverse video and then press **ENT**.
6) Enter a file name, using up to 16 alphanumeric characters. Select character(s) by operating the trackball and pressing **ENT**. After completing the file name, select "ENTER" by the trackball and then press **ENT**.

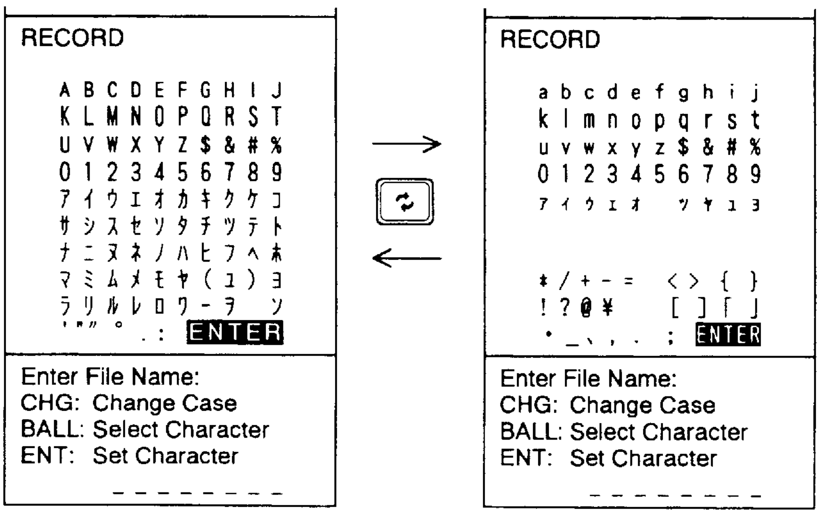


Figure 7-2 Characters available for file name

7) Specify the area on the display you want to record, by using the cursor and the trackball.

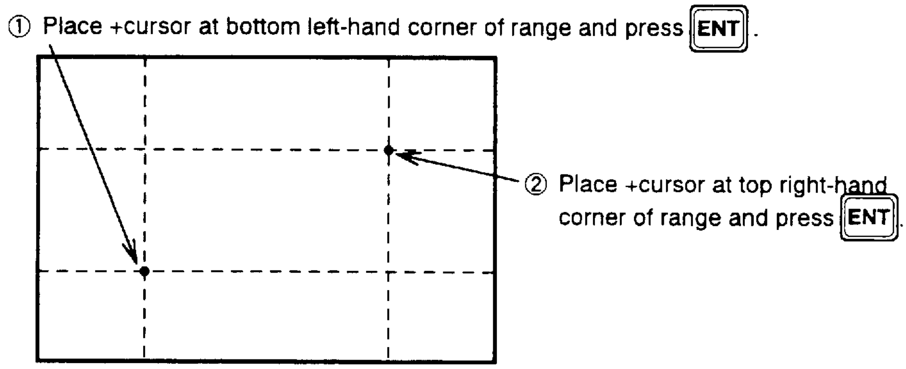


Figure 7-3 How to select area to record

The number of data points within the area specified appears on the display. If the number of data points is within the storage capacity of the medium the data are recorded. "RECORDING...Please Wait." appears on the display during recording.

Recording data to an existing file

You can write over an (unnecessary) existing file, in which case all data in the file are erased.

1) Insert the floppy disk or memory card which contains the file you want to write over.
2) Press **MENU**, **8** and **1**. The prompt asks you to select a medium.
3) Select medium; floppy disk, memory card or file memory. Free memory space on the medium selected appears on the display.
4) Enter data you want to record. To record main track, sub track, and mark/line, for example, press **1**, **2**, **3** and **ENT**.
5) Press [↑]/[↓] to select file to write over. (If the file you want to write over is not shown, press [←]/[→] to change the page.)
6) Press **ENT**.
7) Press **2**.
8) Specify area to record. See step 7 in the previous procedure.

The number of data points within the area specified appears on the display. If the number of data points is within the storage capacity of the medium the data are recorded. "RECORDING...Please Wait." appears on the display during recording.

When data cannot be recorded...

When data cannot be recorded an error message appears and the unit emits several beeps. In this case, decrease the size of the area to record.

Table 7-1 Conditions under which data cannot be recorded

Condition	Error Message	Remedy
Number of data points is greater than 30,000. (Maximum number of points per file is 30,000)	Data too large to save. Reduce size of area or items to save.	Decrease size of area to record.
Number of data points exceeds storage capacity of medium.	Not enough space on medium. Insert new medium and press ENT.	For floppy disk or memory card, insert blank (formatted) disk or card.
Too many files on medium (maximum 50 files).	Not enough storage space.	Erase unnecessary file(s).

Replaying Data

Replaying fundamentals

You can replay data stored on a floppy disk, a memory card or the file memory. Note however that a replayed file is mixed with the current display. If the track memory is full when you replay data, parts of both the track and the replayed picture may be erased to make room for replayed file. For those reasons, you may want to record and then clear the current display before replaying data.

Replaying data

To replay data;

1) Insert floppy disk or memory card in the proper drive.
2) Press **MENU**, **8** and **2**.
3) Select medium by pressing appropriate numeral key. Free memory space in the working memory appears on the display.
4) Select item(s) to replay;
   - main track
   - sub track
   - mark/line
   - waypoint/route
   - target point, or
   - all.

   To replay, main track, sub track, and mark/line, for example, press **1**, **2**, **3** and **ENT**.
5) Select file to replay by pressing [↑]/[↓]. ([←]/[→] change the page.) The total number of points in the file selected appear on the display.
6) Press **ENT**. The message "REPLAYING...Please Wait." appears during the replaying. When replaying is completed the RECORD/REPLAY menu appears.

■ **NOTE:** *Waypoints, routes and target points of the current display are erased when they share the same number with associated marks in a replayed picture.*

Copying Data

Copying fundamentals

You may copy data between storage media. The procedure depends on location of source data and target data.

- If the source data is in the working memory the procedure is same as that for recording data. For floppy disk or memory card you copy data by file.
- If the target data is in the working memory, the procedure is the same as that for replaying data.

Procedure

To copy data;

1) Press **MENU**, **8** and **3**.

```
RECORD/REPLAY

1
2
3  Copy
4
5
6
7
8
9
0
-------------------------
Select Source Medium:
1  Floppy Disk
2  Memory Card
3  File Memory
4  Working Memory
```

Figure 7-4 RECORD/REPLAY menu, copy

2) Select location of source data. If you select working memory (4), the procedure is the same as that for recording (see page 7-4). For floppy disk, memory card or file memory, go to the next step.
3) Select target medium.
4) Enter numbers of items to be copied.
5) Select file by pressing [↑]/[↓].
6) Press **ENT**. "COPYING...Please Wait." appears on the display during copying. When copying is completed the RECORD/REPLAY menu appears.

When you copy data from a memory card or floppy disk to the working memory;

- Data are copied to an empty area of the working memory.
- Parts of copied data may be erased, when the working memory becomes full, to record new track.
- When copying is completed, copied data may be erased, to record new track, when the working memory becomes full.

Recording/Replaying Data by Data Logger

What is the data logger?

In addition to its basic function of displaying ship's track, the 188 can also function as a data logger, automatically recording ship's position or data fed from an external source (water temperature, depth, etc.) to a floppy disk. You can record one type of data by either by time or distance.

Recording

To record data by data logger;

1) Insert a formatted floppy disk into the floppy disk drive.
2) Press **MENU, 8, 4** and **1**.

```
Enter Number:

1  New Log
2  Add to Existing
```

Figure 7-5 Conditions for data logger recording

3) Enter recording method. Press;

   1 to overwrite past data to start recording afresh, or replace floppy disk.
   2 to add data to existing data.

4) Select recording method; time or distance. If you want to record every 30 seconds, for example, press **1** (to select time), **0, 0, 3, 0** and **ENT**.

   For recording by distance, 0.1 nautical miles, for example, press **2** (to select distance), **0, 0, 1, 0** and **ENT**.

5) To stop logging, press **MENU, 8, 4, 2** and **2**.

Replaying

Follow the procedure below to replay data logger data.

1) Insert floppy disk into the floppy disk drive.
2) Press **MENU**, **8**, **4** and **5**. The display should now look like Figure 7-6.

```
Enter Replay Starting
Position:

                   _ _ %
```

Figure 7-6 Prompt which asks where you want to start replaying data logger

3) Enter the point in percentage where you want to start replaying. For example, if you want to replay data from the 20% point, press **2** and **0**. For all, press **0** twice.

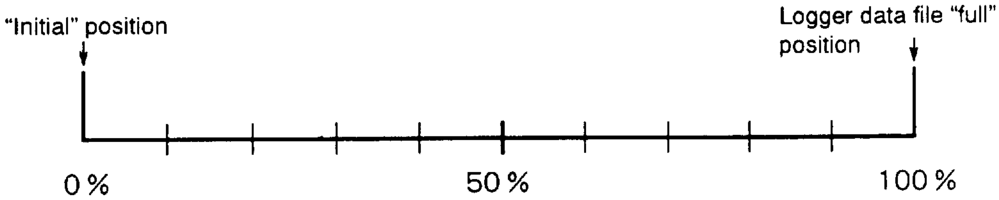


Figure 7-7 How to determine where to start replaying data logger data

4) Press **ENT**. The message "REPLAYING LOG..." appears on the display. The larger the data the more the time required for replay.

Stopping replaying

Temporarily

Press **MENU**, **8**, **4**, **7** and **2**.

Permanently

Press **MENU**, **8**, **4**, **6** and **2**.

Displaying a Floppy Disk Chart

What is a floppy disk chart?

Early model FURUNO video plotters used floppy disk charts. These can be used with the 188.

Procedure

To display a floppy disk chart;

1) Insert floppy disk into the floppy disk drive.
2) Press **MENU, 8** and **5**.

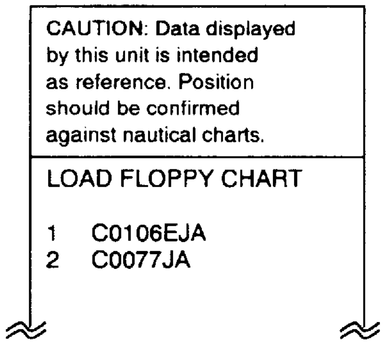


Figure 7-8 LOAD FLOPPY CHART display

3) Select the chart you want to display by pressing [↑]/[↓] keys.
4) Press **ENT**. The message "LOADING CHART...Please Wait." appears on the display. When replaying is completed the RECORD/REPLAY menu appears.
5) Remove the floppy disk.

■ **NOTE:** *When a floppy disk chart is inserted into the floppy disk drive just after turning on the power, the electronic chart displayed previously appears on the display. Press* **Scale** *keys to display floppy disk chart.*

Recording/Replaying User Data

What are user data?

When installing the 188 the installing technician enters various settings to tell it how it is to operate. These settings are called user data.

User data are track; marks; waypoints; electronic chart; position display in latitude and longitude ON/OFF; cursor (cross hair, parallel and circle) ON/OFF; navigator priority; track plotting interval; track color; smoothing; chart scale (programmed and automatic); mark/line color, shape and input method; waypoint color and input method; alarm range for waypoint, arrival alarm, XTE alarm, target proximity alarm, water temperature alarm, depth, wake-up timer; time update method; comments; satellite navigator mark; external event mark; "T" mark; hour mark; course vector; water temperature, depth and course vector ON/OFF; fish mark ON/OFF; own ship mark; grid color; cursor colors; display on navigation data display; enlarged indications: location, size, color and ON/OFF of characters on the plot display; track color by water temperature/depth; unit of measurement for water temperature, depth and distance; position data source; programmed and automatic chart scale (scale, ON, OFF); automatic own ship mark centering ON/OFF; track recording off settings; key response; function key programs; interface setting; and sub track ON/OFF.

User data and memory clear

When you clear all memories, to start fresh operation, the unit restores all default user data settings. While those are fine for some operations, you probably have your own preferences. Rather than reentering your settings one by one (which would take considerable time) you can record them to a floppy disk and automatically reenter them by replaying the floppy disk.

Recording

You can record one set of user data per floppy disk.

1) Insert a formatted floppy disk into the floppy disk drive.
2) Press **MENU**, **8**, **7** and **1**.

Replaying

To replay user data;

1) Insert floppy disk into the floppy disk drive.
2) Press **MENU**, **8**, **7**, **2** and **2**. The message "REPLAYING USER DATA...Please Wait." appears on the screen during replaying. You cannot stop replaying.

Confirming Free Memory Space on a Medium

Introduction

You can confirm free memory space on a floppy disk, a memory card or the file memory.

Procedure

To confirm free memory space;

1) Insert floppy disk or memory card into proper drive.
2) Press **MENU**, **8** and **0**.

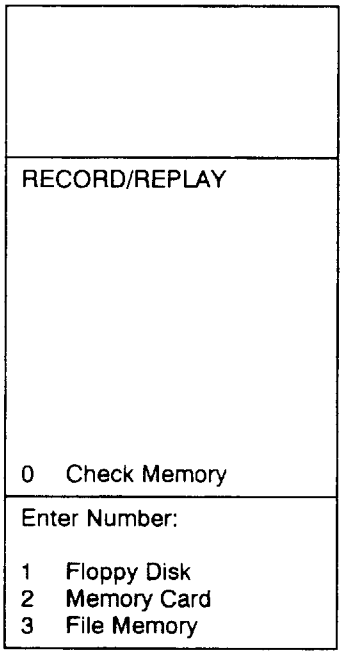


Figure 7-9 RECORD/REPLAY menu, check memory

3) Select medium. Free memory space appears on the display.
4) Press any key to return to the RECORD/REPLAY menu.

Deleting a File

Procedure

To delete a file;

1) Insert floppy disk or memory card in proper drive.
2) Press **MENU**, **8** and **8**. The prompt asks you to select a medium.
3) Select medium; floppy disk, memory card or file memory. The prompt asks you to select a file.
4) Press [↑]/[↓] to select a file.
5) Press **ENT**. The prompt asks if it is alright to erase the file.
6) Press **2**. The message "DELETING FILE...Please Wait." appears during the deleting.

CUSTOMIZING YOUR UNIT

This chapter provides the information necessary for customizing the 188 to your liking and operating needs.

A few of the things you will learn how to customize are

- text displays
- function keys
- remote control unit
- units of measurement
- memory apportioning, and
- key response volume.

Changing Text Attributes

What you can do with text

The text on the plotter display provide navigation information such as time, position and depth. Their default arrangement is shown in the figure on page 1-19. This section shows you how to customize them to your liking, in four ways:

1) **Turn them on or off.**
2) **Change color.** You can choose from red, yellow, green, light-blue, purple, blue, or white.
3) **Change size.** There are five sizes: normal, double, quad width, double height, and quad size. See Figure 8-1 for sizes.

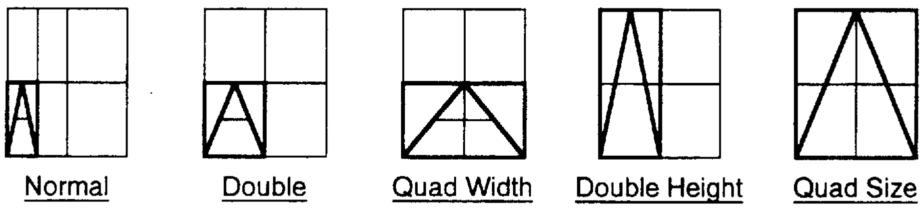
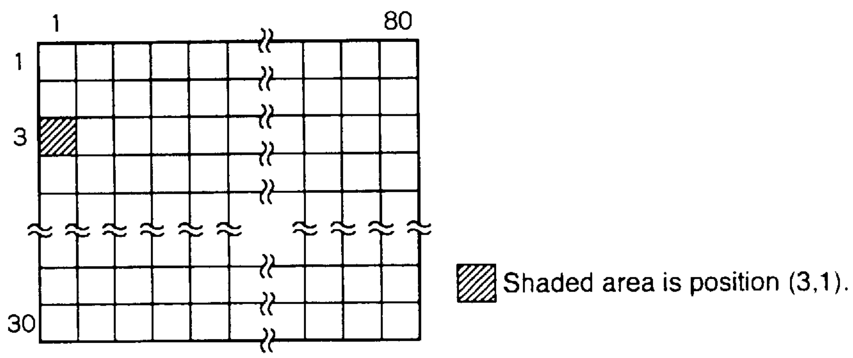


Figure 8-1 Sizes available for text

4) **Change location.** You can relocate text anywhere you like. See Table 8-1 and Figure 8-2 for text size and picture configuration.

Table 8-1 Text size and picture configuration

Text Size	Picture Configuration (lines × characters)
Normal	30 × 80
Double	30 × 40
Quad Width	15 × 40
Double Height	30 × 20
Quad Size	15 × 20



Picture Construction (Normal character = 30 lines × 80 columns)

Figure 8-2 How to determine text location on the display

General procedure

The procedure which follows shows how to change all text attributes.

1) Press **MENU, 9, 1, 2** and **3**. Page 1 of the TEXT ON PLOTTER DISPLAY menu appears. This menu consists of four pages.
2) Press **0** to display page desired.

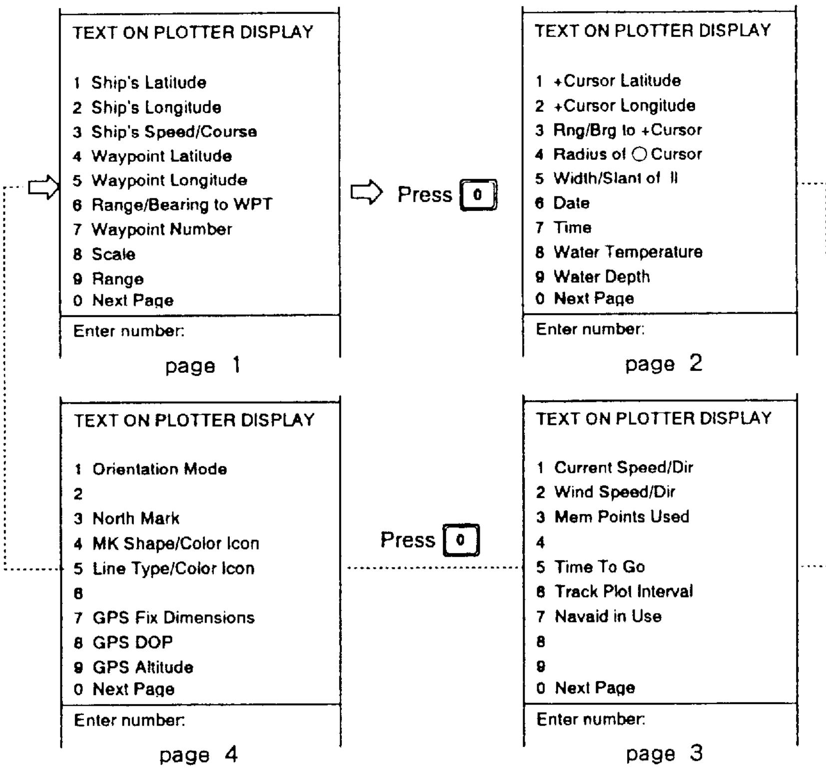


Figure 8-3 Four pages of TEXT ON PLOTTER DISPLAY menu

3) Select the text you want to change. For example, press **1** to select "Ship's Longitude" (on first page). The menu shown in Figure 8-4 appears.

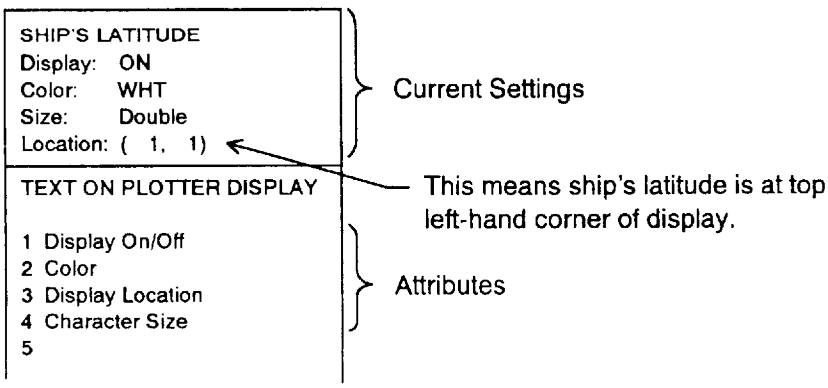


Figure 8-4 TEXT ON PLOTTER DISPLAY menu, ship's latitude

4) Press **1** to select "Display On/Off." Press **1** to turn it off; **2** to turn it on.

5) Press **2** to select "Color." Select color by pressing appropriate numeral key.

6) Press **3** to select "Display Location." Press **Arrow** keys to select location and then press **ENT**.

7) Press **4** to select "Character Size". Press the **Scale** keys to change size and then press **ENT**.

■ **NOTE:** *The text displays "MK Shape/Color Icon" and "Line Type/Color Icon" may only be turned on or off and their location changed.*

Example

In Figure 8-5 the attributes of the ship's latitude and longitude text are as follows:

1. Display: ON
2. Color (This manual does not show colors.)
3. Location: Latitude, 25:1; longitude, 27:1 (bottom left-hand corner)
4. Size: Quad

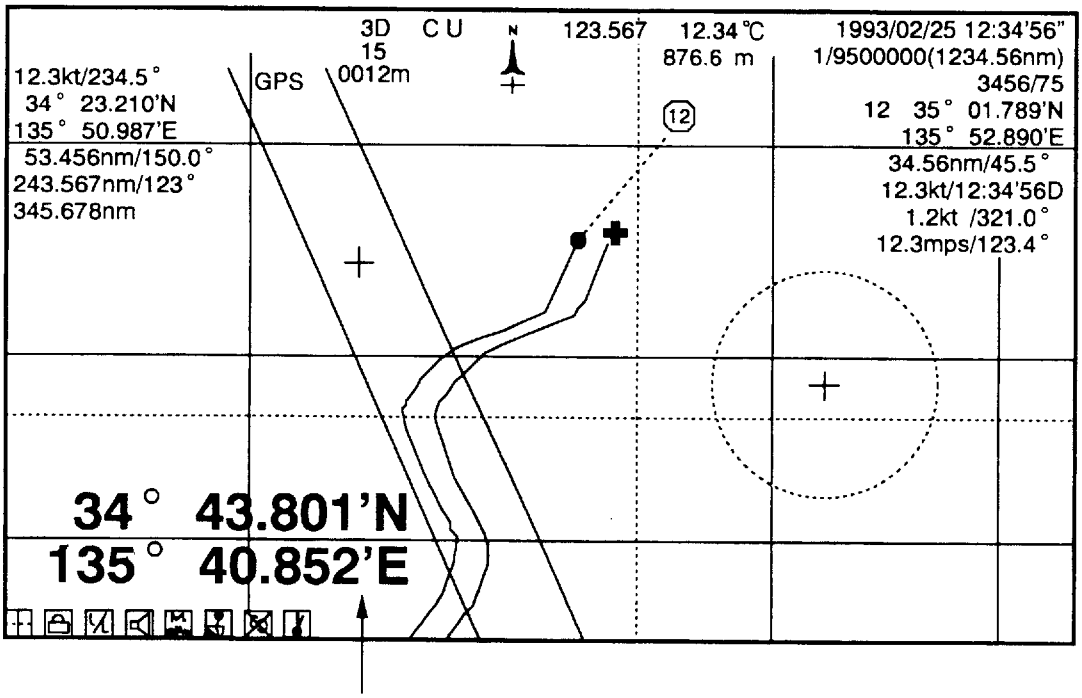


Figure 8-5 Sample display, showing latitude and longitude displays in quad size, location 25:1 and 27:1

Programming the Function Keys

Introduction

Instead of repeating keystrokes manually, you can define a function key to perform the task automatically. For example, you can define a function key to select a specific track color, plotting interval, alarm range, etc.

Each of the ten function keys can have two programs, one main and one sub. To execute the sub function, press the **FUNC** key followed by a function key.

The label at the top of the keyboard shows default function for each function key; sub function on top, main function on bottom. Table 1-1 on page 1-19 shows the default function key programs.

Keys used in programming

You will use four keys to program the functions keys. Table 8-2 describes the keys and their functions.

Table 8-2 Keys used in programming the function keys

Key	Function	Display	Example
	Select menus.	M	1
	Input numeric data.	*	2
	Select options on the menu.	N	3
	Turn an item on or off.	–	4

How to program

Example 1

Set main function of function key **F9** for arrival alarm range of 0.05 nautical miles.

1) Press **MENU**, **9**, **1** and **9**. The display shown in Figure 8-6 appears.

SET INIT SETTING
Press function key to program and press ENT.

Figure 8-6 SET INIT SETTINGS menu, prompt for selection of function key to program

2) Press **F9**.

```
Clear current
program of key?:

1 NO
2 YES
```

Figure 8-7 Prompt which asks if it is alright to overwrite current program of function key

3) Press **2** to clear previous program.

4) Press the following keys in order shown:

[7]	Select ALARM menu
[1]	Select arrival/anchor watch alarm
[2]	Select arrival alarm
[0] [0] [0] [5] [ENT]	Enter 0.05 nm range
  *(press twice)*	Erase menu display

"7120005EMM" appears on the display.

5) Press **F9** to register the program.

This completes the procedure for programming a function key. To program another function key, follow repeat the procedure again. After completing programming, press the **ENT** key.

Example 2

Set sub function of function key **F8** as XTE alarm range selection.

1) Press **MENU, 9, 1** and **9**.
2) Press **FUNC** and **F8** to enable programming of F8's sub function.
3) Press **2**.
4) Press **7, 2, 2,**  ,  and  . "722*MM" appears on the display.
5) Press **FUNC, F8** and **ENT**.

This concludes the programming procedure. When you want to change the XTE alarm range, press **FUNC**, **F8** and then enter range in four digits.

Example 3

Set main function of function key **F7** as main track color selection.

1) Press **MENU**, **9**, **1** and **9**.
2) Press **F7**.
3) Press **2**.
4) Press **2**, **3**, **1**, **SEL**, and . "231NMM" appears on the display.
5) Press **F7** and **ENT**.

This concludes the programming procedure. When you press function key **F7** the TRACK menu appears, where you can change track color.

Example 4

Set the sub function of function key **F7** to enable switching the course vector display on or off.

1) Press **MENU**, **9**, **1** and **9**.
2) Press **FUNC** and **F7**.
3) Press **2**.
4) Press **9**, **1**, **2**, **1**, **6**, , and . "91216-MM" appears on the display.
5) Press **FUNC**, **F7** and **ENT**.

When you want to switch on (or off) the course vector display, press **FUNC** and **F7**.

Programming Other Keys

Introduction

The keys shaded in Figure 8-8 may be programmed to suit your operating needs. You can even program a function different from what appears on the key label. The procedure for programming these keys is the same as that for the function keys.

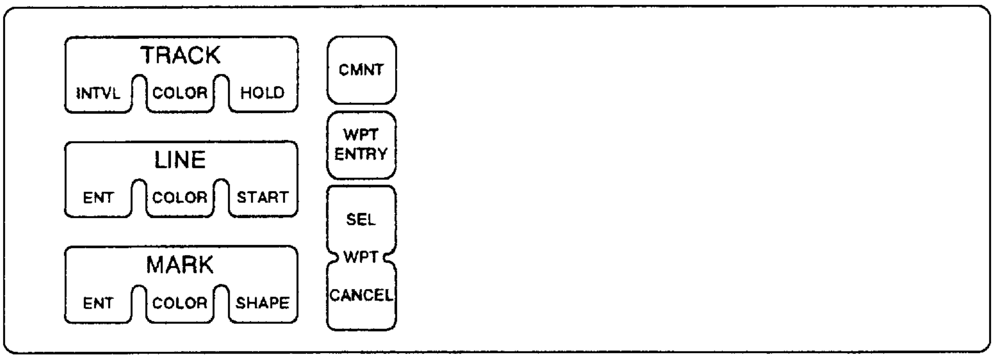


Figure 8-8 Keys which you can program

Procedure

To program the **TRACK INTVL** key to enable entry of plotting interval by time (rather than distance);

1) Press **MENU, 9, 1** and **9**.
2) Press **TRACK INTVL**.
3) Press **2**.
4) Press **2, 2** and **3**.
5) Press **TRACK INTVL**.
6) Press **ENT**.

The Remote Control Unit

Function

The remote control unit lets you operate the display unit from up to five meters away. It operates in two modes: standard and user. You can program both modes to your liking.

Key description

Table 8-3 provides a description of the remote control unit keys.

Table 8-3 Functions of remote control unit keys

Key	Standard Mode	User Mode
MARK ENT	Enter mark.	Erase mark at cursor intersection
MARK COLOR	Change mark color.	Select plot mode.
MARK SHAPE	Change mark shape.	Select navigation data display.
TRACK COLOR	Change track color.	Turn main track on or off.
TRACK SEL	Select track.	Turn sub track on or off.
TRACK HOLD	Stop recording track.	Turn mark/line display on or off.
TRACK INTVL	Change track plotting interval.	Turn waypoint display on or off.
RPLY MC	Replay memory card.	Turn electronic chart on or off.
RPLY FD	Replay floppy disk.	Turn floppy disk chart on or off.
RCD MC	Record memory card.	Turn water temperature graph on or off.
RCD FD	Record floppy disk.	Turn depth graph on or off.
WP	Enter waypoint.	Turn file data display on or off.
CMNT	Enter comment.	Display cursor information.
WP SEL	Set destination.	Select route.
CNTR	Return own ship mark to screen center.	Change arrival alarm range.
SEL	Same as on display unit.	Disable arrival alarm.
↖↗↙↘		Change XTE alarm range.
↘↙↗↖		Disable XTE alarm.
↑		Select North-up mode.
→		Select Course-up mode.
←		Turn circle cursor on or off.
↓		Turn parallel cursor on or off.
#	Enter a waypoint.	Enter line by cursor.
WP CANCEL	Cancel destination.	Erase track by two points.

Confirming key program

Follow the procedure below to see how a key on the remote control unit is programmed.

1) Press **MENU, 9, 1** and **9**.
2) Press the key on the remote control unit which you want to know its program. (See Figure 8-10 for which keys which can be programmed.) In Figure 8-9 a key is programmed in the key sequence of 91214, as shown on the top of the menu screen. For complete menu tree, see the appendix.

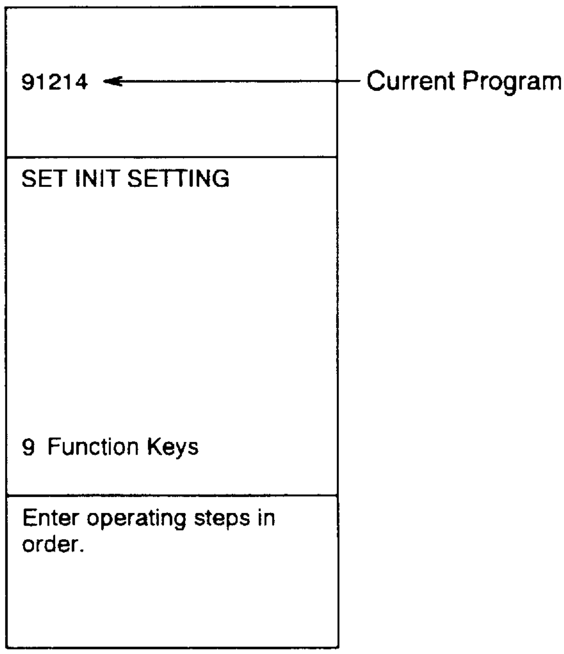
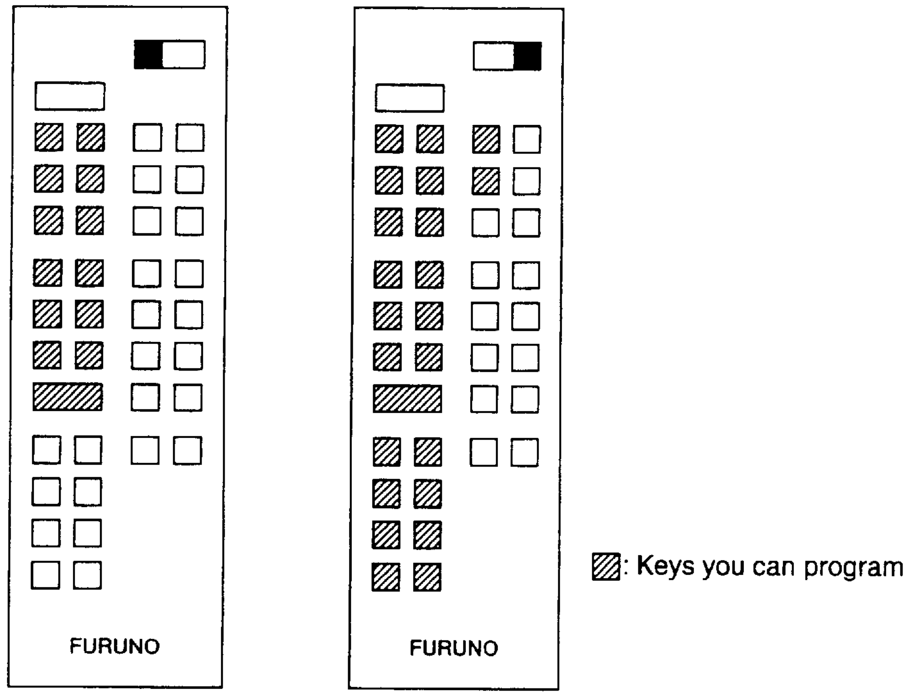


Figure 8-9 SET INIT SETTINGS menu, set function keys

3) Press **1**, **ENT** and **MENU** twice.

Programming

The remote control unit keys which you can program are shaded in Figure 8-10. The procedure is the same as that for programming the function keys on the display unit.



Standard Mode Keys   User Mode Keys

Figure 8-10 Remote control unit keys which you can program

Example

Change plot interval input method (standard mode) of the **TRACK INTVL** key on the remote control unit from time to distance.

1) Press **MENU, 9, 1** and **9**.
2) Set the Mode switch on the remote control unit to "STD" and then press **TRACK INTVL**.
3) Press **2** to delete current program.
4) On the display unit, press **2**, **2**, **3**, , and . "223*MM" appears on the display.
5) Press **TRACK INTVL** and **ENT**.

Changing Color of Markers

Introduction

All markers listed below are assigned a specific color at the factory. You may change their colors as you like. The empty boxes in the keying sequences which follow are where you enter color, by pressing numeral keys.

Markers may be displayed in the following colors:

Red = 1 Yellow = 2 Green = 3 Light-blue = 4
Purple = 5 Blue = 6
White = 7 (for other than background color)
Black = 7 (for background color only)

Own ship mark

To change the color of the own ship mark, press;

[MENU] [9] [1] [2] [2] [1] [ ]

Grids

Press the following keys to change the color of the grids.

[MENU] [9] [1] [2] [2] [2] [ ]

Cross hair cursor

You can change the color of the cross hair cursor by pressing;

[MENU] [9] [1] [2] [2] [3] [ ]

Circle cursor

Press the following keys to change the color of the circle cursor.

[MENU] [9] [1] [2] [2] [4] [ ]

Parallel cursor

To change the color of the parallel cursor, press;

[MENU] [9] [1] [2] [2] [5] [ ]

Background color

Press the following keys to change the color of the background.

[MENU] [9] [1] [2] [2] [7] [ ]

Changing Units of Measurement

Distance

Kilometers

MENU 9 1 2 7 2

Nautical miles

MENU 9 1 2 7 1

Water Temperature

Celsius

MENU 9 1 2 5 0 1

Fahrenheit

MENU 9 1 2 5 0 2

Depth

Meter

MENU 9 1 2 6 0 1

Feet

MENU 9 1 2 6 0 2

Fathom

MENU 9 1 2 6 0 3

Hiro

MENU 9 1 2 6 0 4

Passi/Braza

MENU 9 1 2 6 0 5

Chart Scale

Programming

The **Scale** keys change the chart scale. They are preprogrammed in ten ranges. If you prefer your own ranges, program the scale as follows.

1) Press **MENU**, **9**, **1** and **4**. The chart scale settings appear.
2) Program the chart scales to your liking. If you want to change the number 1 to 1/1000, for example, do the following.
   1. Press **1**.
   2. Press;

[0] [0] [0] [1] [0] [0] [0] [ENT]

The display changes to reflect the new arrangement.

Changing chart scale format

There are two formats by which you can select chart scale: user-defined (mentioned on previous page) and step. In the step format, the chart scale changes in the following sequence each time the **Scale** keys are pressed.

$\frac{1}{1{,}000}$ (highest) ↔ $\frac{1}{1{,}100}$ ↔ .... ↔ $\frac{1}{9{,}900}$ ↔ $\frac{1}{10{,}000}$ ↔ $\frac{1}{11{,}000}$ ↔ ....

↔ $\frac{1}{99{,}000}$ ↔ $\frac{1}{100{,}000}$ ↔ $\frac{1}{110{,}000}$ ↔ .... ↔ $\frac{1}{9{,}500{,}000}$ (smallest)

Figure 8-11 Charts scales available in step type format

Step chart scale

Press **MENU**, **2**, **5** and **1**.

User-defined chart scale

Press **MENU**, **2**, **5** and **2**.

Apportioning the Memory

A total of 13,000 points are available for the working memory (track, marks, lines) and file memory (temporary storage for item in current memory, floppy disk or memory card).

■ **NOTE:** *When the memories are apportioned all existing track, marks, lines, etc. are erased. If you require the data, record it to a floppy disk or memory card before apportioning the memory.*

The default working memory capacity is 5,000 points. If you want to change it to 6,000 points for example;

1) Press **MENU 9**, **1** and **7**. The present working memory capacity appears at the top of the menu.

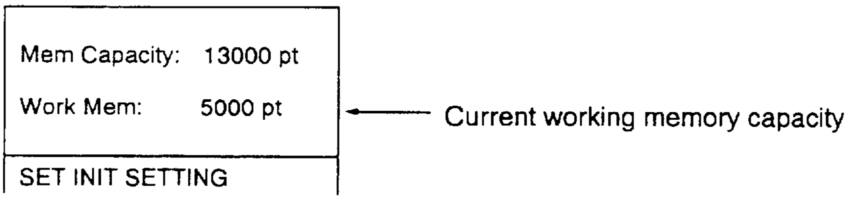


Figure 8-12 SET INIT SETTING menu, set memory apportion

2) Press;

[0] [0] [6] [0] [0] [0] [ENT]

3) Press **2**.

4) Turn off and on the power.

■ **NOTE 1:** *You can allot all memory points (10,000) to the working memory. However, actual memory capacity will be 8,000 to 9,000 points since 1,000 to 2,000 points are reserved for file area control.*

■ **NOTE 2:** *The working memory consists of several memory blocks for separate storage of main track, sub track, marks, lines, comments, etc. Therefore, the number of points shown on the display does not agree with the memory apportion. When the track memory is full, earliest track is erased one by one to make room for new track.*

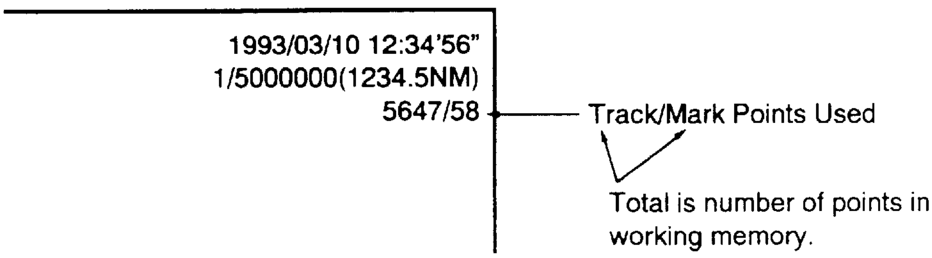


Figure 8-13 Location of track/mark points used

- **NOTE 3:** *When you display data stored in the file area, it takes a considerable time even if its capacity is equal to that of the working memory. Therefore, you should use the file memory for temporary storage of data.*

- **NOTE 4:** *The optional memory boards increase the memory capacity to 200,000 points. One drawback to increased memory capacitity however is it takes longer to redraw the picture. Several tens of minutes are necessary to redraw the picture when the current memory is storing 200,000 points.*

Changing Chart Attributes

Land color

To change land color, press;

MENU | 9 | 1 | 8 | 5 | 3 | Press color key

Land pattern

Land pattern is available in four varieties as follows:

1) Press **MENU, 9, 1, 8, 5** and **4**.

2) Press a numeral key among **1** to **4**; 1 for hollow, 2 for filled, bright, 3 for filled, dim 4 for hatch.

The indices, which you may turn on or off, show the areas on a chart which you can enlarge without losing detail. The smaller index areas give the higher resolution in drawing a chart on the screen. If the indices do not appear, press the **Scale** keys to shrink the display.

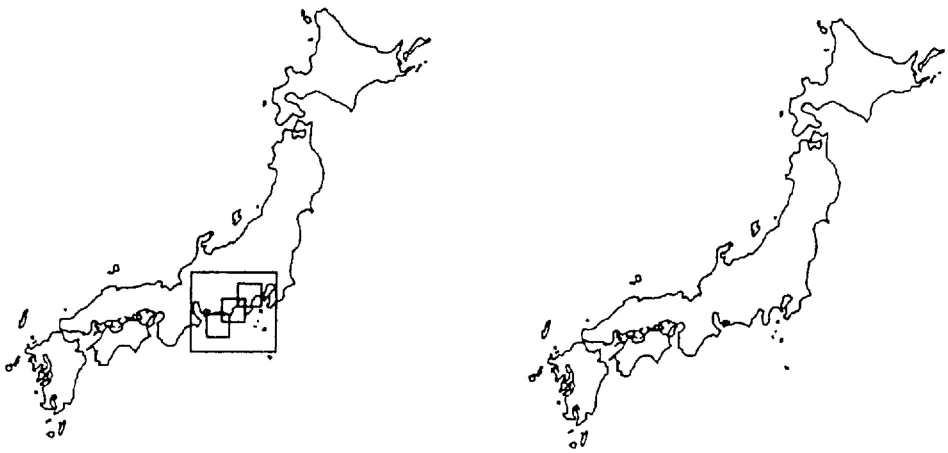


Figure 8-14 Indices on the chart

1) Press **MENU, 9, 1, 8, 5**, and **7**.

2) Press **2** for turning on, or **1** for turning off.

Place-name indication

Each chart card shows geographic name places. You can turn them on or off.

1) Press **MENU, 9, 1, 8, 5, 8** and **2**.

2) Press **2** for turning on, or **1** for turning off.

Miscellaneous Functions

Centering of own ship mark

The own ship mark can be automatically returned to the screen center when it nears a display edge.

Turning off

[MENU] [9] [1] [8] [1] [1]

When this function is turned off the own ship mark may go off the display. You can return it to the screen center by pressing **CHG** to turn off the cursor and then pressing **CNTR**.

Turning on

1) Press **MENU, 9, 1, 8, 1** and **2**.
2) Specify range.

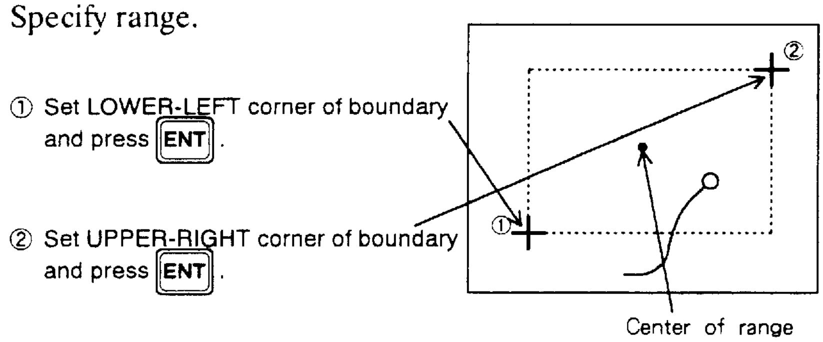


Figure 8-15 How to select range for automatic centering of own ship mark

The own ship mark automatically returns to the center of the area specified in step 2 when it reaches a boundary specified.

Changing grid format

The grid may be displayed in one of three patterns:

Variable (two to four grid lines depending on chart scale)

[MENU] [9] [1] [8] [3] [1]

Equidistant (latitude and longitude grids equal up to 60° lat)

[MENU] [9] [1] [8] [3] [2]

User-defined

1) Press **MENU, 9, 1, 8, 3** and **3**.
2) Enter latitude grid spacing.

3) Enter number of grids.
4) Enter longitude grid spacing.
5) Enter number of grids.

Automatic chart scale selection

You may wish to have a specific chart scale selected for you when arriving at waypoints. (Arrival alarm range can be set on the ALARM menu.)

Turning on

To get the 1/5000 chart scale when arriving at waypoints, for example;

[MENU] [9] [1] [8] [4] [2] *(auto chart scale on)*

[0] [0] [0] [5] [0] [0] [0] [ENT]
(1/5000 chart scale)

Turning off

[MENU] [9] [1] [8] [4] [1]

Event mark on sub track

An event mark is inscribed on the main track when **EVENT (MOB)** is pressed. You may also inscribe this mark on the sub track.

1) Press **MENU**, **9**, **1**, **8** and **6**.

2) Press **2** for turning on, or **1** for turning off.

Changing keyboard response volume

A beep sounds every time you press a key. You can adjust the volume of the beep as follows.

1) Press **MENU**, **9**, **1**, **8** and **7**.
2) Press a numeral key among **1** to **4**; **1** for lowest volume, **4** for highest.

Enabling/disabling the trackball

To enable or disable shifting of the display and cursor by track-ball;

1) Press **MENU**, **9**, **1**, **8** and **9**.

2) Press **2** for enabling, or **1** for disabling.

Setting the Bearing Display

Introduction

You may display bearing data in true bearing (relative to True North rather than magnetic north) or magnetic bearing.

Magnetic bearing

The location of the magnetic pole is different from the geographical north pole. This causes a difference between the true and magnetic north direction. The difference is called magnetic variation, and varies with respect to the observation point on the earth.

The 188 is programmed with the earth's magnetic variations. However, you may wish to further refine variation.

1) Press **MENU, 9, 1, 6** and **2**.
2) Select method by which to enter offset:
   - 1 for No offset
   - 2 for Auto offset, or
   - 3 for Manual offset

For manual offset...

3) Press **3** to select Manual Offset.
4) Enter offset, consulting a recent nautical chart. Press the **CHG** key to change coordinate if necessary.
5) Press **ENT**.

The current offset appears at the top of the SET OFFSETS menu. The offset icon ( ) appears on the plotter display. If you manually entered magnetic bearing be sure to change setting when magnetic variation changes.

True bearing

Press **MENU, 9, 1, 6, 2** and **1**.

Offsetting Chart Position

Introduction

In some instances chart position may be off by a few minutes. In Figure 8-16, for example, the position of a ship to be at sea while it is in fact moored at a pier.

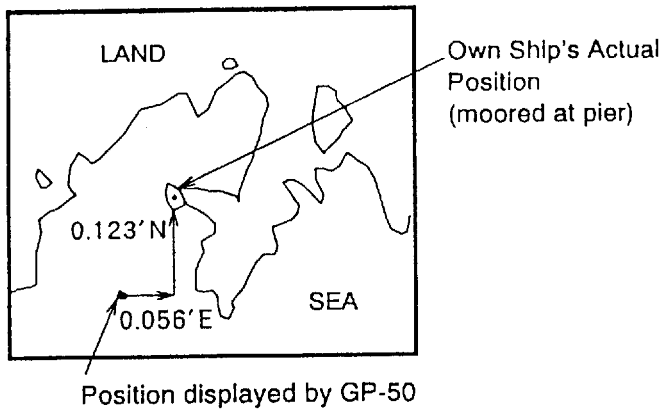


Figure 8-16 Error 01.23 minutes North latitude, and 0.056 minutes East longitude

The 188 offers two methods by which you can enter chart offset: by trackball and by latitude and longitude minutes. When you apply an offset the icon ( ) appears on the plotter display.

Setting by trackball

To apply offset by trackball;

1) Press **MENU**, **9**, **1**, **6** and **4**.
2) Press **2** to select By Trackball.
3) Operate trackball to set offset.
4) Press **ENT**.

The offset entered appears at the top of the SET OFFSETS menu, chart position.

Setting by lat/long

To apply offset by latitude and longitude minutes;

1) Press **MENU**, **9**, **1**, **6** and **4**.
2) Press **3**.
3) Enter latitude offset in minutes followed by **ENT**.
4) Enter longitude offset in minutes followed by **ENT**.

Offsetting File Position

Introduction

The 188 can read files created on late model FURUNO plotters. However, position error is likely because of the difference between the position fed by the navaid used in creating the file and GPS chart system. You can apply an offset, either manually or automatically, to compensate for the error.

Manual offset

To manually apply offset to a file;

1) Copy the data in the floppy disk or memory card to the file memory.
2) Display the file copied to the file memory. Measure offset value in latitude and longitude.
3) Press **MENU**, **9**, **1**, **6** and **3**. Medium contents appear on the display.
4) Press [↑]/[↓] to select file and press **ENT**.
5) Press **3** to select Manual Offset. The prompt asks you to enter latitude offset.
6) Enter latitude offset and press **ENT**. The prompt asks you to enter longitude offset.
7) Enter longitude offset and press **ENT**.

The offset entered appears at the top of the SET OFFSETS menu.

Auto offset

You can automatically apply an offset to compensate for the difference in sub track and main track positions.

1) Copy file on floppy disk or memory card to the file memory.
2) Press **MENU**, **9**, **1**, **6** and **3**. Medium contents appear on the display.
3) Press [↑]/[↓] to select file and press **ENT**.
4) Press **2** to select Auto Offset.

Water Temperature and Depth Graphs

Introduction

Water temperature and depth may be displayed in graph form, at the bottom of the display. These functions require external water temperature and depth sensors.

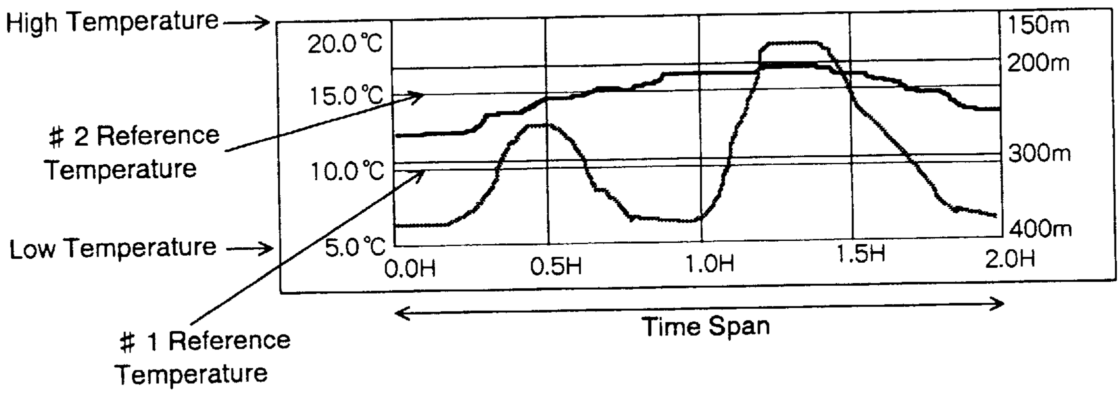


Figure 8-17 Sample water temperature and depth graphs

Setting the water temperature graph

To set the water temperature graph;

1) Press **MENU, 9, 1, 3, 1** and **1** to select Set Graph Color.

Enter Number:	
1 RED	5 PPL
2 YEL	6 BLU
3 GRN	7 WHT
4 CYN	

Figure 8-18 Color menu

3) This option sets the color of the two reference temperature lines and temperature indications. (To avoid confusion, the color should be different than that for reference depth lines and indications.) Select color desired by pressing appropriate numeral key.

4) Press **2** to select Set Time Span.

5) Enter time span, up to 24 hours, and press **ENT**.

■ **NOTE:** *You cannot enter a time span for both water temperature and depth graphs. Precedence is given to the last-entered time span.*

6) Press **3** to select Set Temp Range.

7) Enter temperature range from low to high.

8) Press **4** to select Set Ref Temp 1. Enter temperature for the #1 reference temperature line.

9) Press **5** to select Set Ref Temp 2. Enter reference temperature for the #2 reference temperature line.

10) Press **9** to select Temp Graph On/Off.

11) Press **1** to turn the graph off, or **2** to turn it on.

Setting up the depth graph

To set up the depth graph;

1) Press **MENU, 9, 1, 3, 2** and **1** to select Set Graph Color.

2) This option sets the color of the reference depth lines and depth indications. (To avoid confusion, the color should be different than that for reference temperature lines and indications.) Select color desired by pressing appropriate numeral key.

3) Press **2** to select Set Time Span.

4) Enter time span, up to 24 hours, and press **ENT**.

■ **NOTE:** *You cannot enter a time span for both depth and water temperature graphs. Precedence is given to the last-entered time span.*

5) Press **3** to select Set Depth Range.

6) Enter depth range from low to high.

7) Press **4** to select Set Ref Depth 1. Enter temperature for the #1 reference depth line.

8) Press **5** to select Set Ref Depth 2. Enter reference depth for the #2 reference depth line.

9) Press **9** to select Depth Graph On/Off.

10) Press **1** to turn the graph off, or **2** to turn it on.

MAINTENANCE AND TROUBLESHOOTING

This chapter describes how to keep your unit in good working order.

You will learn how to

- conduct routine maintenance
- troubleshoot
- conduct the self-tests, and
- clear the memories.

Maintenance

Routine maintenance

Routine maintenance is essential for good performance. A maintenance program should be established and should at least include the items listed in Table 9-1.

Table 9-1 Recommended routine maintenance

Item	Checkpoint	Remedy/Procedure
Antenna (GP-188)	• Check for loosened and corroded mounting bolts.	• Tighten loosened bolts. Replace corroded bolts.
Antenna cable (GP-188)	• Check connection point for watertightness. • Check connector for tightness and corrosion. • Check cable for damage.	• Replace damaged parts.
Display unit connectors	• Check for tight connection and corrosion.	• Replace if corroded.
Ground terminal	• Check for tight connection and corrosion.	• Clean if necessary.
Display unit surface and CRT	• Dust and foreign material on the display unit surface and CRT.	• Dust on the CRT dims the picture. Remove dust with a soft cloth. The only recommended cleaning agent is anti-static spray. Never use chemical solvents to clean the display screen. They may remove paint and markings.
Floppy disk drive head	• A dirty floppy disk drive head can destroy information stored on a floppy disk.	• Clean the floppy disk drive as follows: 1. Insert the floppy disk drive cleaning disk (supplied) into the drive. 2. Press **MENU**, **8**, **1** and **1**. 3. Repeat step 2 two to five times.

Replacing the fuse

The fuse on the rear of the display unit protects the system from reverse polarity of ship's mains and equipment fault. If the fuse blows, find out the cause before replacing the fuse. Be sure to use the proper fuse. Using the wrong fuse will damage the unit and void the warranty.

Proper fuse

12 V set = 20 A fuse
24 V set = 7 A fuse

Demagnetizing the display

If picture color looks uneven it may be due to stray magnetic fields on the display. To restore normal picture, try turning the power off and on. If that doesn't work use a demagnetizer.

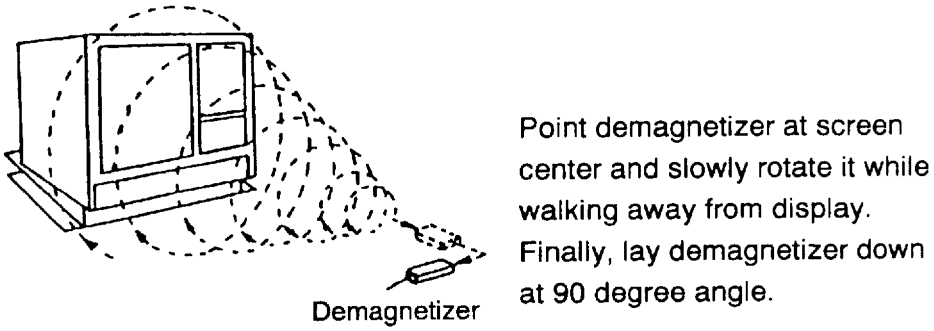


Figure 9-1 How to use a demagnetizer

Troubleshooting Tables

Introduction

Whenever you feel your unit is not working properly, follow the appropriate troubleshooting table in this section to try to restore normal operation. In many cases the cause of an operating problem is simple; wrong key pressed, loosened connector, etc.

If you cannot restore normal, please do not attempt to check inside any unit. Any repair work is best left to a qualified technician.

GD-188/GP-188

Table 9-2 Troubleshooting table for GD-188/GP-188

If...	Then...	Remedy
you cannot turn on the power	• fuse may have blown. • check for loosened power connector. • power supply may be off.	• Replace fuse. • Reconnect connector. • Turn on power supply.
you can turn on the power but NG (error) appears in self-test results	• circuit board or display unit may be defective.	• Execute memory test on by MENU 9-9-1 to check for proper operation. If the results show error, call for service.
you can turn on the power but nothing appears on the display	• brilliance may be too low.	• Press **BRILL** to raise brilliance. If that doesn't work, call for service.
the remote control unit does not work	• its batteries may be dead.	• Replace batteries (two AAA size).
a key on the remote control unit does not work	• key may be defective.	• Execute remote control unit test by (MENU 9-9-2-2) to check key for proper operation.
you cannot erase a mark	• several marks may be occupying the same position.	• Press **CLR** several times.
old track is erased	• the track memory is full.	• Save track to a floppy disk or memory card and then delete it from the display, or delete unnecessary track.

(Continued)

If...	Then...	Remedy
the track is not displayed	• track recording is turned off. • no track is displayed when track is not recorded. • track display may be turned off.	• Press **TRACK HOLD** to restart. • If you want to display track while recording is suspended, press MENU-9-1-8-2-2-2. • Press MENU 1-5-1-1-2 if you want to show track while recording of track is stopped.

GP-188

Table 9-3 Troubleshooting table for GP-188

If...	Then...	Remedy
position is not fixed within 45 minutes after turning on the power	• ship's position entered is wrong by more than 10 degrees. • the almanac stored in the GPS receiver is more than one-year old.	• Display MENU 9-0-1-1-3 and enter correct position. • Execute cold start by pressing MENU 9-0-1-9.
position is not fixed	• there may be antenna problems.	• Check antenna connectors for tight connection. • Check for water leakage in antenna cable.
latitude and longitude position is wrong **NOTE:** *If position data is fed by external navigator check it for proper operation.*	• geodetic chart system selected may be wrong. • apply offset to position. • antenna height setting may be wrong.	• Display MENU 9-0-1-1 and check chart system setting at top of menu. • Display MENU 9-0-1-1-4 and apply position correction. • Display MENU 9-0-1-1 and check antenna height setting at top of menu.
position-fixing availability is shorter than other vessels	• DOP is lower than that set on other vessels. • maximum elevation angle setting is too high.	• Raise DOP on MENU 9-0-1-3-2. • Lower elevation angle setting on MENU 9-0-1-3-3. (Normal setting is five degrees. Setting over ten degrees decreases position-fixing availability time.)

Self-Tests

Introduction

The 188 contains several self-test facilities to check it for proper operation. These are Memory & I/O test, Keyboard test, Remote control unit test and Color test.

Memory & I/O test

This test checks the unit's memories and I/O for proper operation.

1) Press **MENU, 9, 9** and **1** to start the test. An asterisk appears beside the memory or I/O device being tested.

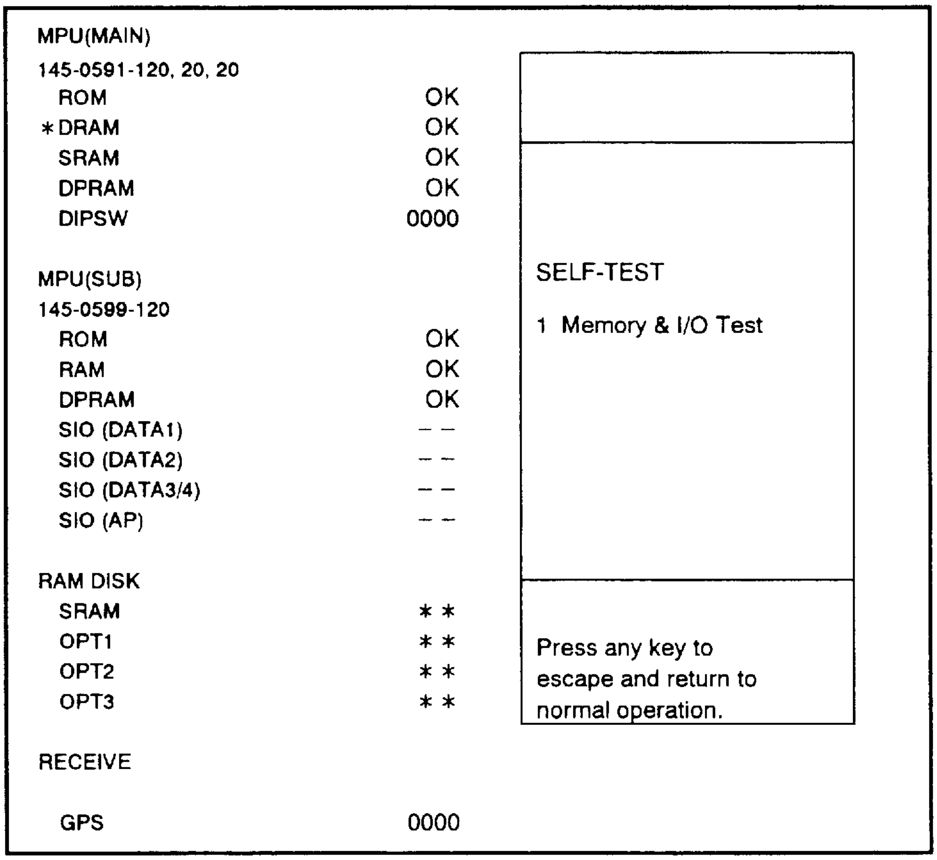


Figure 9-2 Sample memory and I/O test results

2) Press any key to escape. The display shows the SELF-TEST menu.

Test results

The display shows OK for normal operation, NG in case of error, or "**" for no check (optional equipment not installed).

If NG appears for...

- SUB or MAIN MPU, the MPU Board (14P0241) may be defective.
- RAMDISK, the RAMDISK Board may be defective. This board is an optional p.c. board, so "**" appears if it is not installed.

Keyboard test

This test checks the keyboard of the display unit for proper operation.

1) Press **MENU, 9, 9** and **2**. (If the SELF-TEST menu is displayed, simply press **2**.)
2) Press **1** to select "Main Unit Keyboard. The display now looks like Figure 9-3.

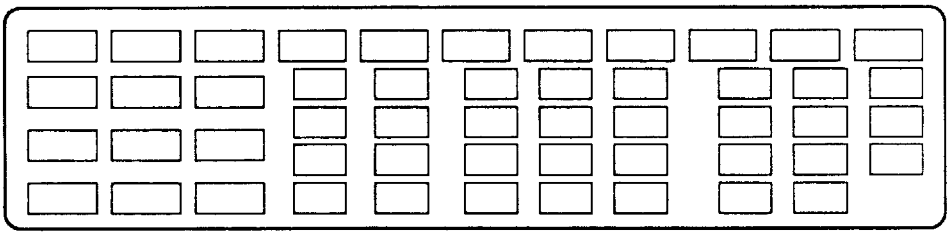


Figure 9-3 Display appearance in display unit keyboard test

3) Press each key one by one. If a key is operating properly its location on the display lights in light-blue. If it doesn't light the PNL Board (14P0243) may be defective.

■ **NOTE:** *The* **DIM** *key's location on screen does not light.*

4) Press **CLR** three times to escape. The SELF-TEST menu appears.

Remote control unit

This test checks the keys of the remote control unit for proper operation.

1) Press **MENU, 9, 9** and **2**. (If the SELF-TEST menu is displayed, simply press **2**.)
2) Press **2** to select "Remote Control."
3) Press each key on the remote control unit one by one. If a key is operating properly its location on the display lights in yellow or purple, depending on Mode switch setting. Yellow in the standard mode; purple in the user mode.

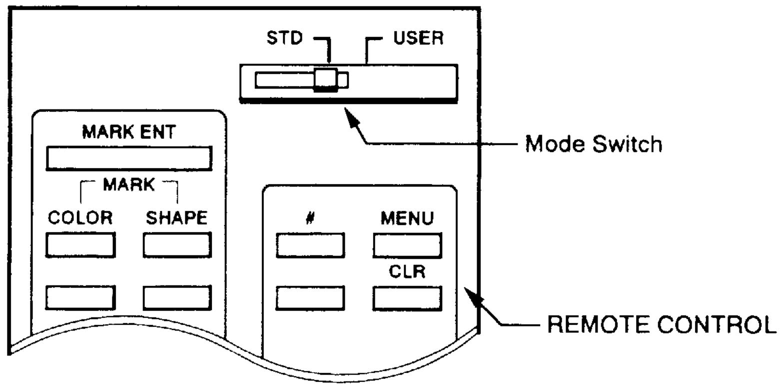


Figure 9-4 Remote control unit

4) Press **CLR** three times to escape.

■ **NOTE:** *If there is no response to key input, try replacing the batteries. If that doesn't work, the remote control unit, the RIM Board (14P0247) or MPU Board (14P0241) may be defective.*

Color test

This test checks for proper display of all colors.

1) Press **MENU**, **9**, **9** and **3**. (If the SELF-TEST menu is displayed, simply press **3**.) All colors appear on the display. Check for correctness.

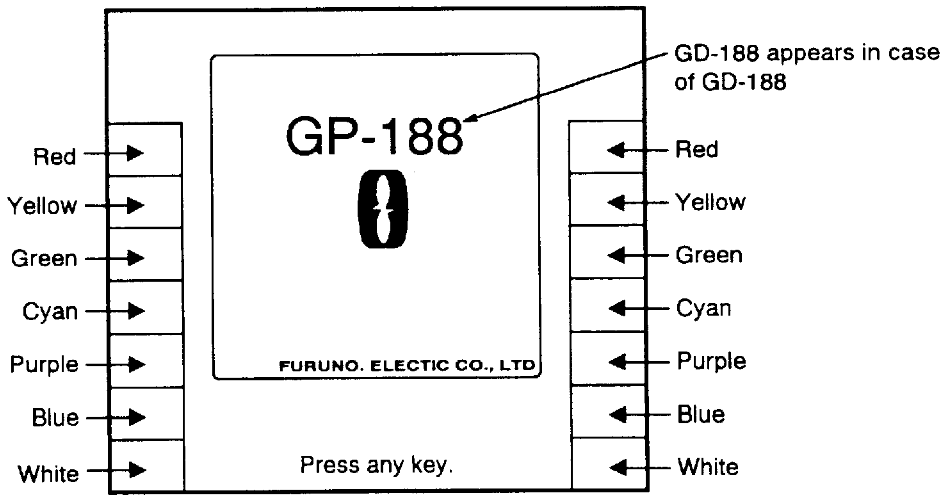


Figure 9-5 Color test display

If a color is missing or looks uneven, try to demagnetize the display by turning off the power or using a demagnetizer.

2) Press any key to escape. The display shows the SELF-TEST menu.

Clearing the Memories

Introduction

Display data are stored in two areas:

- The **working memory** contains track, marks, lines, comments, waypoints, routes, danger points, etc., and any data replayed by floppy disk or memory card.
- The **file memory** temporarily stores data for transfer to the working memory, floppy disk or memory card.

Specific memory

You can clear the working memory or file memory as follows:

1) Press **MENU, 9** and **9**.
2) Press **0** and **2**. The prompt asks you to select a memory to clear.

```
Select memory to clear:

1 Working Memory
2 File Memory
```

Figure 9-6 Selection of memory to clear

3) Press **1** to clear the working memory, or **2** to clear the file memory.
4) Press **1, 8, 8** and **ENT**. The prompt asks you to turn off the power.
5) Turn off the power to clear the memory specified in step 3.

All memories

You can clear the working memory and the file memory together. The 188 restores all default settings when you do so.

1) Press **MENU, 9, 9, 0** and **1**.
2) Press **1, 8, 8** and **ENT**.
3) Turn off the power.

Option program

The option program is currently under development. However, we show the procedure for clearing the program for your reference.

1) Press **MENU, 9, 9, 0** and **3**.
2) Press **1, 8, 8** and **ENT**.
3) Turn off the power.

GPS data (GP-188)

All GPS data set on MENU 9-0-1 can be cleared to start afresh. When you clear GPS data, the GPS receiver automatically executes cold start to fix its position. It takes from 15 to 45 minutes to fix position.

1) Press **MENU, 9, 9, 0** and **9**.
2) Press **1, 8, 8** and **ENT** to clear GPS data and restore default settings.

Table 9-4 Default GPS settings

Time	UTC	Position-fixing Mode	2D
Position	38°N, 123°W	DOP	20
Position Correction	0.00' (none)	Elevation Angle	5
Geodetic Chart	WGS-84	Smoothing	L/L, 0; S/C, 5
Antenna Height	5 meters		

3) Turn off the power.

GPS RECEIVER OPERATION (GP-188)

This chapter covers GPS receiver operation. It contains the following topics:

- GPS description
- how to display and read the GPS data display
- system settings, and
- how to cold start the GPS receiver.

GPS Description

What is GPS?

GPS is an acronym meaning Global Positioning System. GPS (sometimes referred to as NAVSTAR) is a highly precise satellite navigation system developed by the U.S. Department of Defense.

When full global coverage becomes available, a constellation of 24 satellites (including three spares) emplaced in nearly 20,000-kilometer high 12-hour circular orbits will provide highly precise, continuous, worldwide, all-weather position plus time and velocity information to GPS receiver-equipped vehicles, vessels and aircraft.

How the GPS receiver fixes its position

The GPS receiver continuously fixes its position by receiving three (or four) satellites within line-of-sight. The basic steps in position fixing are as below.

1. GPS satellites continually transmit their own precise orbital data called ephemeris. The GPS receiver computes satellites' position by this data.
2. The GPS receiver measures very accurate distances to the satellites.
3. Satellite location and their distances from the GPS receiver are known. The GPS receiver fixes its own position by triangulation.

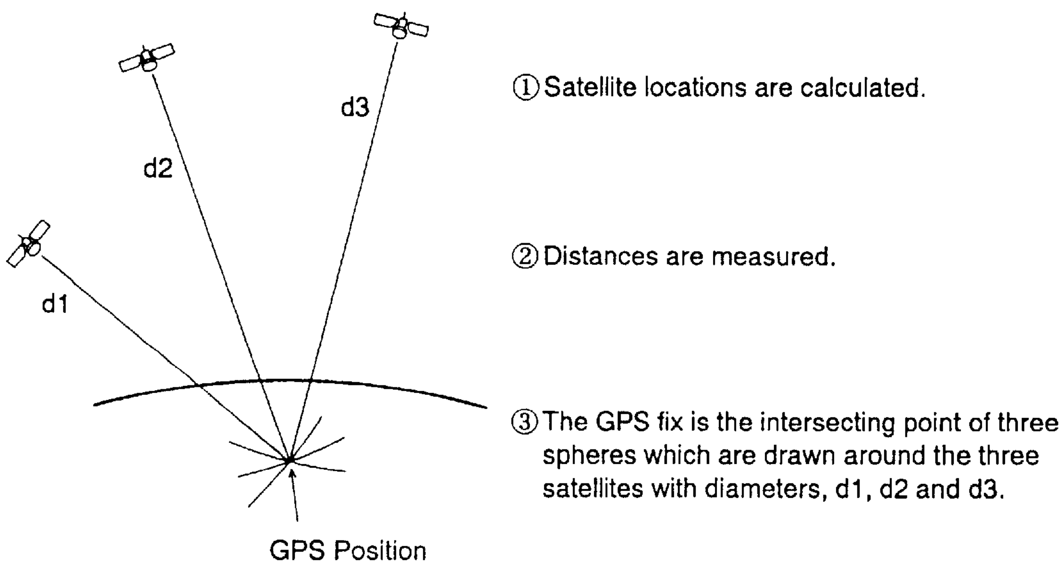


Figure 10-1 How the GPS receiver finds its position

Position-fixing accuracy

GPS position-fixing accuracy is subject to satellite location. Generally, the further apart the satellites are from one another, the greater the position-fixing accuracy. For example, take a look at the two illustrations in Figure 10-2. In both illustrations a fix is obtainable in the Northern Pacific region because three satellites are in line-of-sight. However, position-fixing accuracy will be higher in the right-hand figure since the satellites are spread farther apart than the left-hand figure.

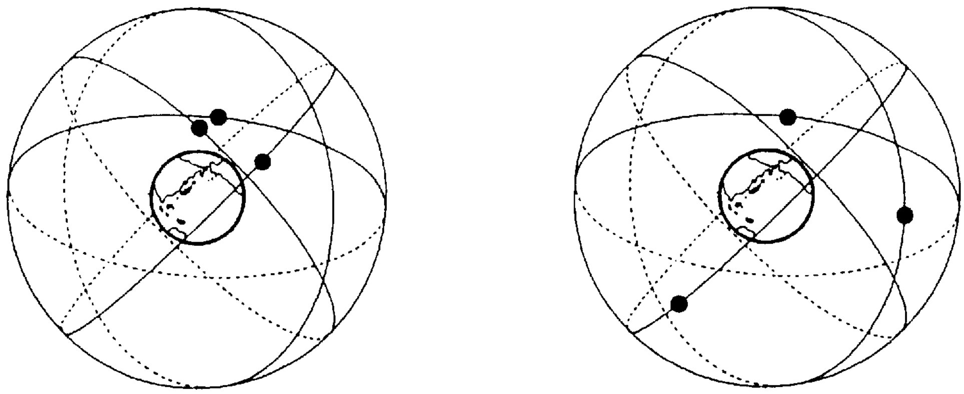
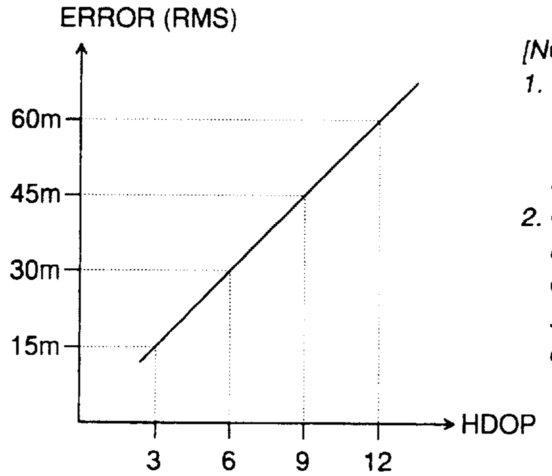


Figure 10-2 Satellite position and accuracy of fix

The index for position-fixing accuracy is known as HDOP (Horizontal Dilution of Precision). In simpler terms it is the geometrical relationship among three (or four) satellites. The higher the HDOP value the less accurate the position fix. The error in distance is proportional to the HDOP value as shown in Figure 10-3.



[NOTE]
1. *The error shown is observed on the GP-188 under favorable receiving conditions.*
2. *GPS accuracy is controlled by the US Government. The error shown is subject to change.*

Figure 10-3 HDOP rate and position fix error

Almanac

Every satellite broadcasts its own orbital data and estimated orbital data of other satellites. This is called the **Almanac.** Using the Almanac the GPS receiver predicts arrival times of all GPS satellites, to acquire and receive GPS satellites.

The GPS Data Display

How to display

To display the GPS data display;

1) Press **MENU**, **1** and **1**.

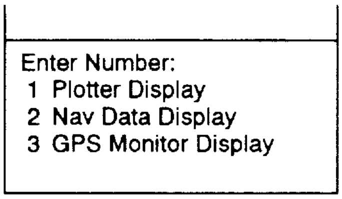


Figure 10-4 Selection of display

2) Press **3** to display the GPS data display. Figure 10-5 shows a sample display.

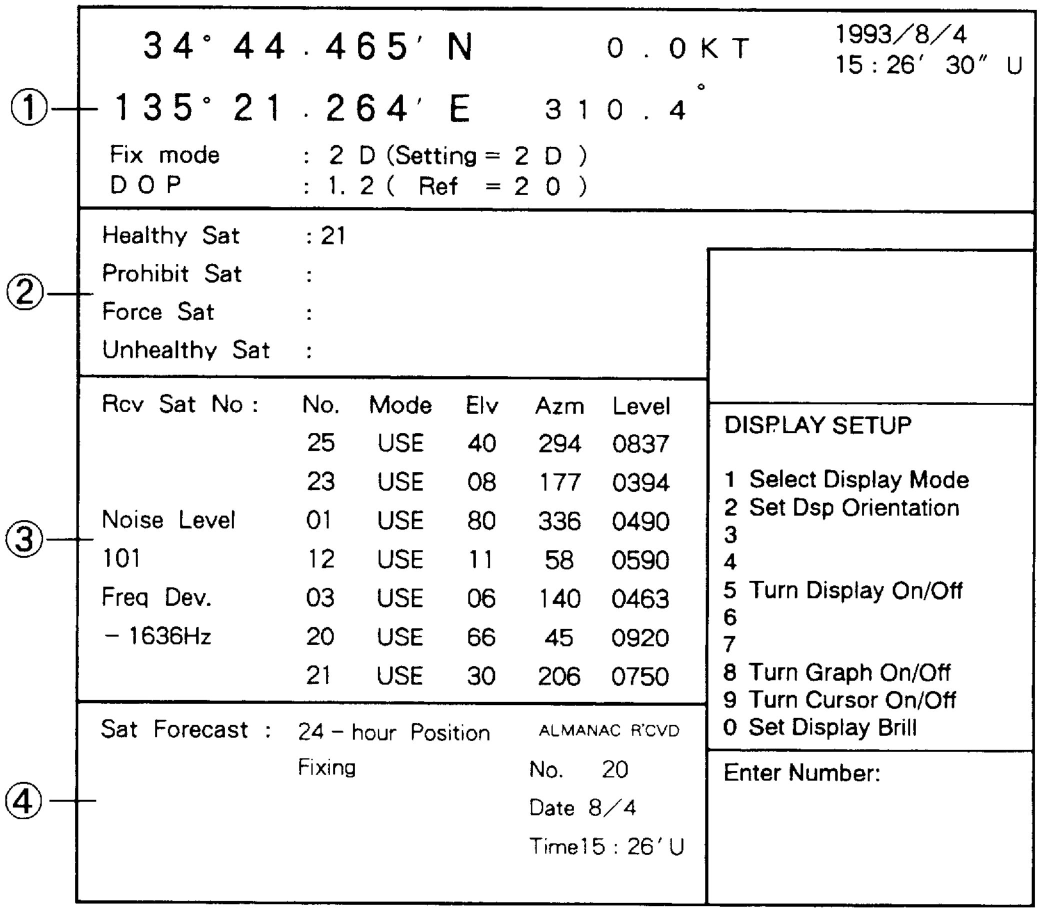
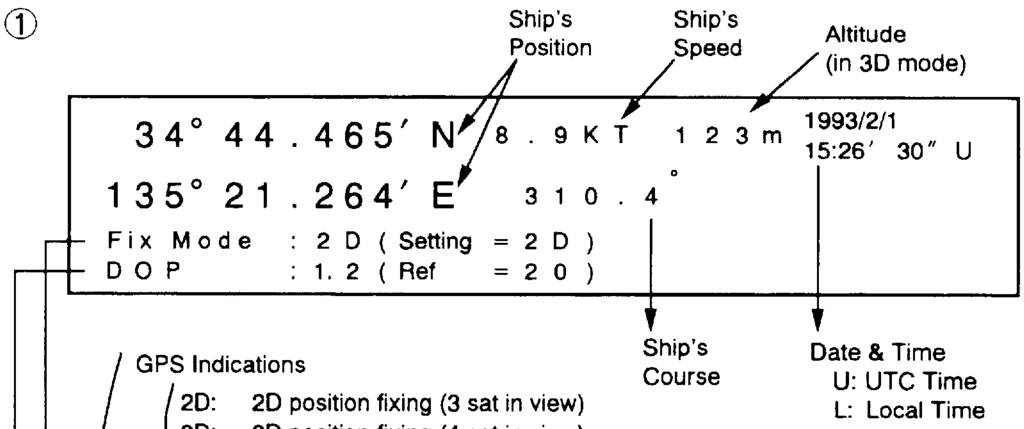


Figure 10-5 Sample GPS data display

3) Press **1** twice to return to the plotter display.

Reading the GPS data display

①



GPS Indications

- 2D: 2D position fixing (3 sat in view)
- 3D: 3D position fixing (4 sat in view)
- DOP: Actual DOP value
- ACQ: Acquiring satellite
- INT: Position fixing interrupted
- IMP: Impossible to receive
- ALM: Receiving Almanac
- CST: Cold Start in progress

Position-fixing Mode

- 2D: For marine vessels
- 3D: For land venicles
- 2D3D: 3D position fixing when 4 satellites are in view; 2D when 3 satellites are in view

DOP Value

When value is larger than 20 (default setting) own ship mark blinks.

②

Healthy Sat	:21	← Normally functioning satellites
Prohibit Sat	:	← Satellites deleted from satellite schedule
Force Sat	:	← Satellites forcibly restored to satellite schedule
Unhealthy Sat	:	← Malfunctioning satellite; not used in position fixing.

Figure 10-6 Sample GPS data display, first and second sections

③

Rcv Sat No. :	No.	Mode	Elv	Azm	Level
	25	USE	40	294	0837
	23	USE	08	177	0394
	01	USE	80	336	0490
	12	USE	11	58	0590
Noise Level	03	USE	06	140	0463
101	20	USE	66	45	0920
	21	USE	30	206	0750
Freq Dev.					
− 1636Hz					

Frequency deviation should be within ± 3000 Hz. Higher deviation will mean longer time for cold start.

Level Should be 200 or higher to receive.

Satellite position

Normal: 75~110

•TRK: Tracking to use in position fixing
•USE: Currently used in position fixing
•Blank: Not used

Satellites in view

④

Sat Forecast :	24-Hour	ALMANAC R'CVD:	
	Position	No.	20
	Fixing.	Data	2/1
		Time	6:32

Satellite forecast for next 24 hours

This text shows when almanac was received and what satellite it was received from. During position fixing the display changes every one to two minutes. If the plotter is not used for more than one year cold start the GPS receiver to receive latest almanac. See next page.

Figure 10-7 Sample GPS data display, third and fourth sections

System Settings

Introduction

This section shows you how to enter system settings.

GPS settings menu

Press **MENU, 9, 0, 1** and **1** to display the SET GPS SETTINGS menu.

```
SET GPS SETTING

1
2 Time Difference
3 Estimated Position
4 Position Offset
5 Geodetic Datum
6 Antenna Height
7
8
9
0
Enter Number:
```

Figure 10-8 SET GPS SETTINGS menu

Entering estimated position

After installing the unit, the first thing to do is turn on the power to fix GPS position. The GPS receiver then starts looking for a satellite to receive the almanac. It takes about 3 – 10 minutes to receive the almanac and find GPS position. If the position shown on the GPS data display is not within ten degrees of actual position it may take more than 45 minutes. (Press **MENU, 1, 1** and **3** to display the GPS data display.) In this case enter estimated position (within ten degrees) as follows.

1) Press **MENU, 9, 0, 1, 1** and **3**. The display prompts you to enter latitude.
2) Enter estimated latitude.
3) Enter estimated longitude.

Entering time difference (using local time)

If you would rather use local time (rather than UTC), enter time difference between local time and UTC time.

The time differences chart in the Appendix compares time differences in the world.

1) Press **MENU, 9, 0, 1, 1** and **2**.
2) Enter time difference. If the local time is earlier than UTC time enter time difference with a minus sign by pressing the **CHG** key. For example, if the time difference is -8 hours, press the following keys:

[CHG] [0] [8] [ENT]

Entering antenna height

Enter antenna height above the waterline, for accurate determination of GPS position.

1) Press **MENU, 9, 0, 1, 1** and **6**.
2) Select unit of measurement. For example, press **2** for feet.
3) Enter antenna height above the waterline in four digits. If the height is 12 feet, for example, press **0, 0, 1, 2** and **ENT**.

■ **NOTE:** *For areas where the antenna height is below the water line, for example, Holland, enter height with a minus sign by pressing the* **CHG** *key, before entering height.*

Entering geodetic chart system

The default geodetic chart setting is WGS-84, the standard GPS chart system. The GP-188 can use other chart systems if you tell it what chart system to use. The chart systems it recognizes appear in the Appendix.

To select a chart other than WGS-84, do the following.

1) Press **MENU, 9, 0, 1, 1** and **5** to select geodetic datum.
2) Enter chart system. For charts not displayed in the bottom window, first press **7**. Then enter three digit geodetic chart code by referring to the geodetic chart list in the Appendix.

Entering position offset

You may apply an offset to position generated by the GPS receiver to agree with a chart card position.

1) Press **MENU, 9, 0, 1, 1** and **4**.
2) Enter latitude offset and press **ENT**.
3) Enter longitude offset and press **ENT**.

Setting Position Fixing Criteria

This section shows you how to set GPS position fixing criteria. Once set, usually during installation, readjustment is not required. These parameters are set on the SET POS FIX RULES menu, which appears by pressing **MENU, 9, 0, 1** and **3.**

Table 10-1 SET POS FIX RULES menu description

Menu	Description	Key Input Sequence
POSITION FIX MODE	Select position fixing mode. 2D: Position fixing by three satellites in line-of-sight of GPS receiver. 3D: Position fixing by four satellites in line-of-sight of GPS receiver. Position-fixing availability shorter than 2D but higher accuracy. 2D/3D: Position fixing by 2D or 3D (3D when available).	MENU, 9, 0, 1, 3, 1
DOP LIMIT	Index for position-fixing accuracy. When the HDOP threshold is lower than the preset HDOP, the indication "2D" is replaced by "DOP" to show poor position-fixing accuracy. The default setting is 20, which is suitable for most all conditions.	MENU, 9, 0, 1, 3, 2
MINIMUM ELEVATION ANGLE	This sets the minimum elevation angle a satellite must be positioned above the horizon for the GP-188 to use it in position fixing. The standard setting is five degrees.	MENU, 9, 0, 1, 3, 3
POSITION SMOOTH FACTOR	Smooth raw GPS fixes to reduce positioning inaccuracy.	MENU, 9, 0, 1, 3, 4
SPEED SMOOTH FACTOR	Smooth speed data which fluctuate with receiving condition.	MENU, 9, 0, 1, 3, 5

Position smoothing

Description

When the DOP or receiving condition is unfavorable, the GPS fix may change greatly, even if the vessel is dead in water. This change can be reduced by smoothing the raw GPS fixes. A setting between 0 and 9 is available. The higher the setting the more smoothed the raw data. Note however that too high a setting slows response time to change in latitude and longitude. This phenomenon is especially noticeable at high ship's speeds. "0" is the normal setting; increase the setting if the GPS fix changes greatly.

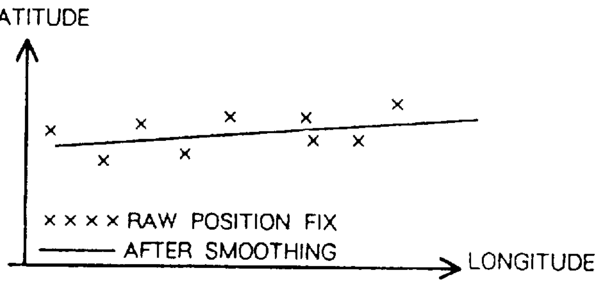


Figure 10-9 Latitude and longitude smoothing

Procedure

1) Press **MENU**, **9**, **0**, **1**, **3** and **4**.
2) Enter smoothing factor (00 to 99 seconds) and press **ENT**.

Speed smoothing

Description

During position fixing, ship's velocity (speed and course) is directly measured by receiving GPS satellite signals. The raw velocity data may change randomly depending on receiving conditions and other factors. You can reduce this random variation by increasing the smoothing. Like with latitude and longitude smoothing, the higher the speed and course smoothing setting the more smoothed the raw data. If the setting is too high, however, the response to speed and course changes slows. For no smoothing, enter "0". "5" is suitable for most conditions.

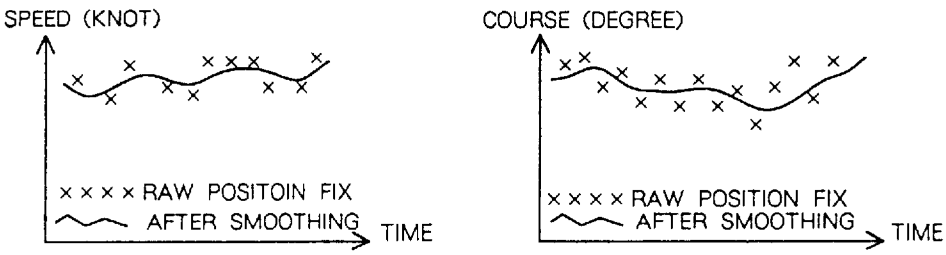


Figure 10-10 Speed and course smoothing

Procedure

1) Press **MENU**, **9**, **0**, **1**, **3** and **5**.
2) Enter smoothing factor and press **ENT**.

Enabling/Disabling Satellites

Introduction

Every GPS satellite is broadcasting abnormal satellite number(s) in the Almanac. Using this information the GPS receiver eliminates any malfunctioning satellite from the GPS satellite schedule. Once the malfunctioning satellite is returned to online status it is automatically restored to the satellite schedule when the Almanac is received. In some instances however the Almanac may not contain information which announces that a satellite is now back on line. If you hear of this through another source, you can manually restore the satellite to the satellite schedule. This is called "Forced Health". Conversely, you can manually "Deselect" a healthy satellite if you hear it is "unhealthy."

Disabling healthy satellite

To disable a healthy satellite;

1) Press **MENU, 9, 0, 1** and **5**.
2) Press **1** to select Disable Healthy Sat.
3) Enter satellite number(s) and press **ENT**.

Enabling unhealthy satellite

Follow the procedure below to enable an unhealthy satellite.

1) Press **MENU, 9, 0, 1, 5** and **2**.
2) Enter satellite number(s) and press **ENT**.

Restoring satellite to schedule

To restore a satellite to the satellite schedule;

1) Press **MENU, 9, 0, 1, 5** and **9**.
2) Enter satellite number(s) and press **ENT**.

Cold Starting the GPS Receiver

Introduction

Cold start is automatically executed at initial power application or when the GPS memory is cleared. This is done to acquire the Almanac to receive a GPS satellite. You can also do the cold start manually when the Almanac is too old to acquire a satellite; for example, when the unit has not been used for about six months. Manually cold starting the GPS receiver erases the existing Almanac to receive the current one.

Procedure

To cold start the GPS receiver;

1) Press **MENU, 9, 0, 1** and **9**.

```
9 Execute Cold Start
---------------------------
Specify satellite to use
in cold start?:
1 NO
2 YES (Fast ACQ)
```

Figure 10-11 GPS SETUP menu, cold start

2) Press **1** to select Cold Start.

```
Execute cold start?:

1 NO
2 YES
```

Figure 10-12 Prompt which asks you if you are ready to execute cold start

■ **NOTE:** *If there is a satellite currently within line-of-sight of the GPS receiver, enter its number. This will lessen the time required to fix position.*

3) Press **2** to execute cold start.

What happens in cold start

- Own ship mark blinks fastly.
- "CST" appears on the plotter display.
- It takes up to 45 minutes to find position (if the latitude and longitude position entered are within 10 degrees of current position).
- When cold start is completed, "2D" appears on the display.

Appendix

The appendix contains the following:

- Specifications
- Control Description
- Menu Tree
- Time Differences
- Geodetic Chart Systems
- Loran C/A Chains
- Decca Chains

Specifications

GPS Receiver Specifications of GP-188

Antenna Type	Helical type
Number of Receiving Channels	8 channels
Tracking Capacity	8 satellites
Tracking System	Parallel in view
Position Fixing System	All in view, 8-state Kalman filter
Accuracy	Horizontal: 15 m RMS (2D, HDOP ≤3 SA OFF) Velocity: 01. kt RMS (2D, HDOP ≤3 SA OFF) *GPS accuracy controlled by U.S. Department of Defense.*
Initial Tracking Time	Warm start: About 45 seconds Cold start: About 10 minutes
Tracking Velocity	200 m/s (380 knots)
Maximum Velocity	1 G
Position-fixing Time	Warm start, 45 seconds; Cold start, 15 minutes (correct position entered)
Position Update Interval	1 second

Common Specifications of GP-188 and GD-188

Display	12" high-resolution color CRT effective area: 220 × 165 mm display pixels: 640 × 480 dots
Projection	Mercator
Usable Area	85° latitude or below
Chart Scale	Free or 10-step program (1/1000 to 1/9500000)
Track Display	Plot interval: by time (0 to 90 min.) or by distance (0 to 99.99 nm) Colors: red, yellow, green, purple, light-blue, blue, white Memory capacity: 13,000 points (see * on next page), standard; 200,000 with expanded memory Dual track display: both main track and sub track
Electronic Chart Card	Land features filled in (two levels of brightness available), hollow, or in cross hatch pattern

Storage Capacity

Item	Storage Capacity
Track, mark, line w/mark, external event	*
Waypoint	198 points
Route (10 pts./route)	10 routes
External waypoint	1 point
Target point	10 points
Comment	*

** 13,000 points can be freely apportioned between track and marks/lines/comments. 200,000 points available with optional expanded memory.*

Information Display

Ship's L/L position (Loran C or Decca LOPs also)
Date and time
Ship's speed and heading
Chart scale (horizontal range)
Waypoint number and L/L position
Range and bearing to waypoint
Cursor intersection L/L position
Range and bearing to cursor intersection
Memory space used (marks/lines)
Water temperature, depth*
Wind speed and direction*
current speed and direction*

Graphic display

Temperature and depth graphs

Alarms

Arrival and anchor watch
XTE (cross track error) and border
Ship's speed
Target point
Wake-up and timer
Water temperature*
Depth*
Current*

** External sensor required*

Input Data Format

FURUNO CIF, NMEA 0183, NMEA 0182 (NMEA 0180C)

Output Data Format

CIF, NMEA 0183

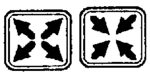
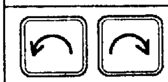
Environment

0°C to 45°C (display unit), -30°C to 70°C (antenna unit)

Power Supply and Power Consumption

12V spec.: 10.8 to 16V DC, less than 150W
24V spec.: 18 to 42V DC, less than 115W
100V, 115V, 120V AC, 1ø, 50 to 60 Hz (rectifier required)

Control Description

Control	Function
FUNC	Press key followed by a function key to execute sub program.
F1 – F9	Execute program.
EVENT (MOB)	Record present position.
TRACK INTVL	Change track plotting interval.
TRACK COLOR	Change track color.
TRACK HOLD	Stop or restart recording track.
LINE ENT	End line input.
LINE COLOR	Change line color.
LINE START	Start line input.
MARK ENT	Enter mark.
MARK COLOR	Change mark color.
MARK SHAPE	Change mark shape.
CMNT	Enter a comment at cursor intersection.
WPT ENTRY	Enter a waypoint.
SEL WPT	Select destination waypoint.
CANCEL WPT	Cancel destination waypoint.
MENU	Display or erase the menu.
ESC	Return to previous menu.
BACK SPACE	Delete character to the left of the data input cursor.
CLR	Erase a mark, waypoint or line; silence audible alarm
1 – 0	Enter numeric data.
 (CHG key)	Change coordinate from North to South, East to West, or vice versa; turn cursor on or off.
ENT	Register data.
 (Scale keys)	Change chart scale, width of parallel cursor, and radius of circle cursor, and character size.
[↑], [↓], [←], [→] (Arrow keys)	Shift item selected by **SEL** key in direction of arrow key pressed.
CNTR	Return own ship mark to screen center.
	Change slant of parallel cursor.
SEL	Select item to shift with trackball (or arrow keys).
BRILL	Change display screen brilliance.
DIM	Change keyboard backlighting.

Menu Tree

① DISPLAY SETUP

- ①Select Display Mode — ①Plotter Display ②Nav Data Display ③GPS Data Display
- ②Set Dsp Orientation — ①North-up ②Course-up ③Waypoint-up
- ⑤Turn Display On/Off
  - ①Track — ①Main Track ②Sub Track — ①OFF ②ON
  - ②Mark/Line ③Waypoint — ①OFF ②ON
  - ④Chart — ①Memory Card ②Floppy Disk — ①OFF ②ON
  - ⑤File Data ⑥Grid — ①OFF ②ON
- ⑧Turn Graph On/Off — ①Temperature Graph ②Depth Graph — ①OFF ②ON
- ⑨Turn Cursor On/Off — ①+Cursor ②○ Cursor ③ || Cursor — ①OFF ②ON
- ⓪Set Display Brill — Enter Brill Level:

② TRACK

- ①Select Navaid
  - ①Main Track Navaid ②Sub Track Navaid — ①DR ②Omega ③Loran A ④Loran C ⑤Decca ⑥GPS ⑦Int GPS ⑧User
  - ⑨Navaid Backup — ①NO ②YES
- ②Set Plot Interval
  - ①Suspend/Resume Plot
  - ②Plot by Time — Enter Time Interval:
  - ③Plot by Distance — Enter Distance Interval:
  - ⑤Record Sub Track — ①NO ②YES
- ③Change Track Color — ①Main Track Color ②Sub Track Color — Color?:
- ④Set Smoothing Factor — Enter Smoothing Factor:
- ⑤Select Scale Format — ①Step ②User-defined
- ⑥Display Specific TRK
  - ①By Color — Dsp Color?
  - ②By Time — Enter starting time: Enter End Time:
  - ③By Line Type — Disp Line
  - ⑤By Track Size (Main) — Number of Plot Points:
  - ⑥By Track Size (Sub) — Number of Plot Points:
  - ⑨Cancel Selection — ①By Color ②By Time ③By Line Type ⑤By Track Size (Main) ⑥By Track Size (Sub) ⑨Cancel All ⓪No Change
- ⑧Erase Track
  - ①By Color/Time
    - ①By Color — Ers Color ?
    - ②By Time — Enter Starting Time: Enter End Time:
    - ③By Line Type — Enter No.:
    - ⑨Cancel Selection
    - ⓪Erase — ①On Screen ②Off Screen ③Specific Area ④On + Off Screen
  - ②Between Two Points — Starting point, End point — ①NO ②YES
- ⑨Change Track Attrib
  - ①Change Color (All) — Old Color ? → New Color?
  - ②Change Color (Part) — Place +cursor on starting point and press ENT. → End point
  - ④Change Line Type — Place +cursor on starting point and ENT. → End point

③ MARK

- ①Change Mark Color — Enter Number:
- ②Change Mark Shape — Enter Number:
- ③Enter Mark — (Place +cursor at point to register and press ENT.)
- ④Enter Comment — Place +cursor on mark (or line) and press ENT.
- ⑤Display Comment List — ↑ ↓ : Change Page
- ⑥Display Specific MK
  - ①By Color — Dsp Color?
  - ②By Time — Enter Starting Time: Enter End Time:
  - ③By Shape — Enter number:
  - ⑨Cancel Selection — ①By Color ②By Time ③By Shape ⑨Change All ⓪No Change
- ⑦Connect MK by Line — ①Start point ②Connect
- ⑧Erase Mark
  - ①By Color — Ers Color?
  - ②By Time — Enter Starting Time: Enter End Time:
  - ③By Shape — ①User-entered Marks ②Ext Event Mark
  - ⑨Cancel Selection
  - ⓪Erase
    - ①On Screen — ①NO (Cancel) ②YES (Erase)
    - ②Off Screen — ①NO (Cancel) ②YES (Erase)
    - ③Specific Area — LOWER-LEFT corner, UPPER-RIGHT corner
    - ④On + Off Screen — ①NO (Cancel) ②YES (Erase)
- ⑨Change Mark Attrib — Place +cursor on mark: New Mark Shape? New color?
- ⓪Set MK Entry Method — Enter Position by: (①Lat/Long ②Rng/Brg ③LC LOPs ④Decca Lop ⑤Ship Pos ⑥+Cursor ⑦LA LOPs)

④ LINE

- ①Change Line Color — Color?:
- ③Enter Line — (Place +cursor on point to register and press ENT.)
- ④Enter Comment — Place +cursor on line and press ENT → Enter Comment
- ⑤Display Comment List — ↑ ↓ : Change Page
- ⑥Display Specific LN
  - ①By Color — Dsp Color?
  - ②By Time — Enter Starting Time: Enter End Time:
  - ③By Line Type — Disp Line
  - ⑨Cancel Selection — ①By Color ②By Time ③By Line Type ⑨Cancel All ⓪No Change
- ⑦Start/Connect Line — ①Start Point ②Connect
- ⑧Erase Line
  - ①Specific Line — Place +cursor on line and press ENT.
  - ②All Lines — ①NO (Cancel) ②YES (Erase)
- ⑨Change Line Attrib — Place +cursor on line and press ENT. Enter Number New color?
- ⓪Set LN Entry Method — Enter Position by: (①Lat/Long ②Rng/Brg ③LC LOPs ④Decca Lop ⑤Ship Pos ⑥+Cursor ⑦LA LOPs)

⑤ WAYPOINT/ROUTE

- ① Select WPT/Route
  - ① Waypoint — Enter FROM /TO Waypoint:
  - ② Route — Enter Route Number:
  - ③ +Cursor — Set position using +cursor and press CHG key. Press ENT to finish.
- ② Enter Waypoint — Enter Waypoint No.:
- ③ Enter Route — Enter Route No.: — Enter Comment :
- ④ Display WPT List
  - ① Select WPT Page — Enter WPT Page No.:
  - ② Enter Waypoint — Enter WPT No.: — Press CHG to turn WPT on or off.
  - ③ Enter Comment — Enter WPT No.:
  - ⑤ Change WPT Number — Enter waypoint no. to change:
  - ⑥ Change WPT Color — Enter waypoint no. to change:
  - ⑧ Erase WPT — Enter waypoint no. to erase:
- ⑤ Display Route List — Enter Route No.: — Trial speed?
- ⑥ Select WPT Page — Enter WPT Page No.:
- ⑦ Set WPT Change Rng
  - ① Set WPT Change Rng — Enter Range from WPT:
  - ② Skip Waypoint — ① No ② Yes
- ⑧ Change WPT Color — Enter Number:
- ⓪ Set WPT Entry Method – Enter Position by: ① Lat/Long ② Rng/Brg ③ LC LOPs ④ Decca Lop ⑤ Ship Pos ⑥ +Cursor ⑦ LA LOPs

⑦ ALARM

- ① Arrival/Anchor Watch — ① Alarm OFF ② Arrival ③ Anchor Watch — Enter Alarm Range:
- ② XTE/Border — ① Alarm OFF ② XTE ③ Border — Enter Alarm Range:
- ③ Target Proximity — ① Alarm OFF ② Alarm ON — Enter Alarm Range:
- ④ Water Temperature — ① Alarm OFF ② High Temp ③ Low Temp ④ Current Rip
- ⑤ Water Depth — ① Alarm OFF ② Deep ③ Shallow — Enter Depth Limit.
- ⑥ Current Speed — ① Alarm OFF ② High ③ Low — Enter Temperature Limit:
  - ④ Select Layer — Enter Layer Number:
- ⑦ Ship Speed — ① Alarm OFF ② High ③ Low ④ Low/High — Enter Speed Limit:
- ⑧ Wake-up — ① Alarm OFF ② Alarm ON — Enter Wake-up Time:
- ⑨ Timer — ① Alarm OFF ② One Alarm ③ Repeat Alarm
- ⓪ Alarm Confirmation

⑧ RECORD/REPLAY

- ① Record — Select Medium: ① Floppy Disk ② Memory Card ③ File Memory — Enter Number:
  - ① Select File: — ① Cancel Recording ② Overwrite
  - ⓪ New File — Enter File Name
- ② Replay — Select Medium: ① Floppy Disk ② Memory Card ③ File Memory — Enter Number: — Select File:
- ③ Copy — Select Source Medium: ① Floppy Disk ② Memory Card ③ File Memory ④ Working Memory — Select Target Medium: ① Floppy Disk ② Memory Card ③ File Memory ④ Working Memory
  - Source: Working Memory (→ Enter Number: of ① Record)
  - Enter Number — Select File:
- ④ Data Logger
  - ① Start Log
    - ① New Log
      - ① No Overwrite
      - ② Overwrite — ① Log by Time ② Log by Distance
    - ② Add to Existing — ① Log by Time ② Log by Distance
  - ② Stop Log
  - ⑤ Start Log Replay — Enter replay starting position:
  - ⑥ Stop Log Replay
  - ⑦ Pause/Resume Replay
- ⑤ Load Floppy Chart — Enter File Name
- ⑥ Load Option Program
- ⑦ Load/Rcd User Data
  - ① Record User Data
  - ② Load User Data — ① No ② Yes
- ⑧ Delete File
  - ① Floppy Disk / ② Memory Card / ③ File Memory — Select file to delete: — ① No ② Yes
- ⑨ Format Medium
  - ① Floppy Disk / ② Memory Card / ③ File Memory — ① No ② Yes
- ⓪ Check Memory — ① Floppy Disk ② Memory Card ③ File Memory

⑨ MISCELLANEOUS

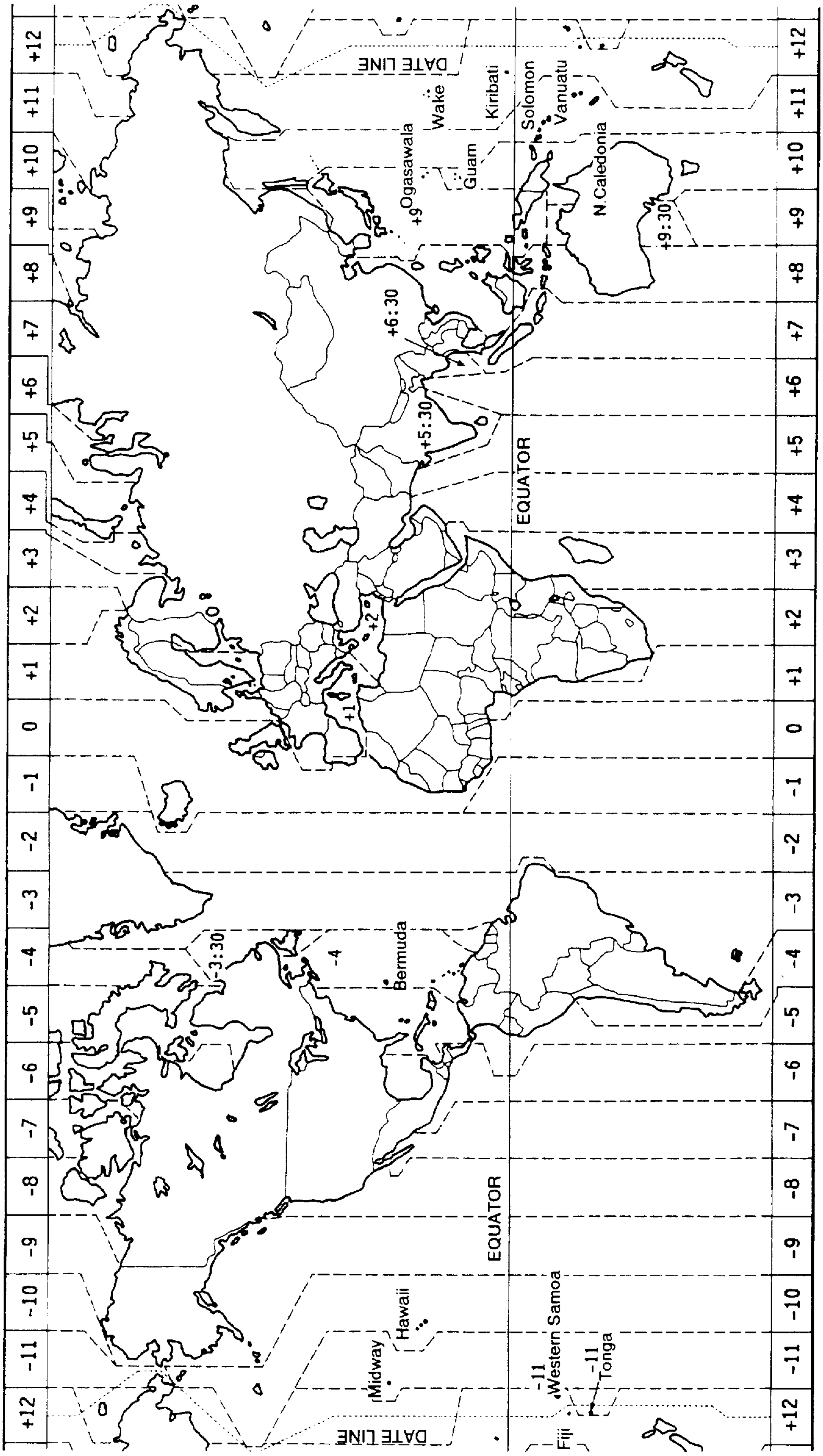
- ① Set Init Setting
  - ① Data/Time — ① Internal Clock ② External Clock — Enter Present Date/Time:
  - ② Display Item/Attrib
    - ① Auxiliary Marks
      - ① Comment / ② Ext Event / ③ Satnav Fix — ① OFF ② ON
      - ④ Time Mark — ① OFF ② "T" Mark Only ③ "T" + h:m.s ④ "T" + Y/M/D/H
      - ⑤ Temp/Depth — ① OFF ② Temperature ③ Depth
      - ⑥ Course Vector / ⑦ Current Vector / ⑧ Fish Mark — ① OFF ② ON
    - ② Marker Color
      - ① Own Ship Mark / ② Grid / ③ +Cursor / ④ ○ Cursor / ⑤ || Cursor / ⑦ Background Color — Enter Number: (Color)
    - ③ Text on Plotter Disp
      - ① Ship's Latitude
      - ② Ship's Longitude
      - ③ Ship's Speed/Course
      - ④ Waypoint Latitude
      - ⑤ Waypoint Longitude
      - ⑥ Range/Bearing to WPT
      - ⑦ Waypoint Number
      - ⑧ Scale
      - ⑨ Range
      - ⓪ Next Page
      - ① +Cursor Latitude
      - ② +Cursor Longitude
      - ③ Rng/Bng to +Cursor
      - ④ Radius of ○ Cursor
      - ⑤ Width/Slant of ||
      - ⑥ Date
      - ⑦ Time
      - ⑧ Water Temperature
      - ⑨ Water Depth
      - ⓪ Next Page
      - ① Current Speed/Dir.
      - ② Wind Speed/Dir
      - ③ Mem Points Used
      - ④
      - ⑤ Time to Go
      - ⑥ Track Plot Internal
      - ⑦ Navaid in Use
      - ⓪ Next Page
      - ① Orientation Mode
      - ③ North Mark
      - ④ MK Shape/Color Icon
      - ⑤ Line Type/Color Icon
      - ⑦ GPS Fix Dimensions
      - ⑧ GPS DOP
      - ⑨ GPS Altitude
      - ⓪ Next Page
        - ① Display — ① OFF ② ON
        - ② Color
        - ③ Display Location
        - ④ Character Size
    - ④ Text on Nav Disp
      - ① Select Navaid — Enter Number:
      - ② Set Headline — Select item to display on headline:
    - ⑤ Track Color by Temp
      - ① RED ② YEL ③ GRN ④ CYN ⑤ PPL ⑥ BLU ⑦ WHT
      - ⑨ Coloring Pattern — ① By Preset Temp / ② By Unit Place
      - ⓪ Unit of Temperture — ① Celsius(℃) ② Fahrenheit(°F)
    - ⑥ Track Color by Depth
      - ① RED ② YEL ③ GRN ④ CYN ⑤ PPL ⑥ BLU ⑦ WHT
      - ⑨ Coloring Pattern — ① By Preset Depth / ② By Unit Place
      - ⓪ Unit of Depth — ① m ② ft ③ fa ④ Hiro ⑤ P/B
    - ⑦ Unit of Distance — ① NM ② KM
    - ⑧ Pos Display Method — ① Lat/Long ② Loran C LOPs ③ Decca LOPs ④ Loran A LOPs
  - ③ Graph Display
    - ① Water Temp Graph — ① Set Graph Color ② Set Time Span ③ Set Temp Range ④ Set Ref Temp1 ⑤ Set Ref Temp2 ⑨ Temp Graph On/Off
    - ② Water Depth Graph — ① Set Graph Color ② Set Time Span ③ Set Depth Range ④ Set Ref Depth 1 ⑤ Set Ref Depth 2 ⑨ Depth Graph On/Off
  - ④ Chart Scale — ① ~ ⓪ — Enter scale to change (0-9):
  - ⑥ Offsets
    - ② Magnetic Variation — ① No Offset ② Auto Offset ③ Manual Offset
    - ③ File Position — Select File: — ① No Offset ② Auto Offset ③ Manual Offset
    - ④ Chart Position — ① No offset ② By Trackball ③ By Lat/Long
  - ⑦ Memory Apportion — Enter storage capacity of working memory:

Continued

⑨ MISCELLANEOUS

- ①Set Init Setting
  - ⑧Misc. Functions
    - ①Ship Mark Centering
      - ①OFF
      - ②ON — Set houndary
    - ②Track During Hold
      - ①Connect Tracks — ①Don't connect ②Connect
      - ②Display Tracks — ①OFF ②ON
    - ③Grid Format — ①Variable(2 to 4) ②Equidistance ③User-defined
    - ④Auto Scale Change
      - ①OFF
      - ②ON — Enter New Scale:
    - ⑤Chart Attributes
      - ③Set Land Color — Set Land Color:
      - ④Set Land Pattern — ①Hollow ②Filled, Bright ③Filled, Dim ④Hatch
      - ⑦Turn Index ON/OFF - ①OFF ②/ON
      - ⑧Set Mark & Attrib 1
        - ①Place Name — ①OFF ②ON
        - ⑨Others — Enter number:
    - ⑥Event on Sub Track - ①NO ②YES
    - ⑦Alarm/Key Volume — ①Enter Volume Level:
    - ⑨Trackball On/Off — ①NO(T-ball OFF) ②YES(T-ball ON)
  - ⑨Function Keys — ①Press function key to program and press ENT.
  - ⓪Mark Pattern — Select mark to change:
- ③Confirm Data — Set +cursor on item and press ENT. key.
- ④Calculate Rng/Brg
  - ①Lat/Long — Enter L/L of 'FROM' point: — Enter L/L of 'To' point:
  - ② +Cursor — Place +cursor on 'FROM' point and Press ENT key and then 'To' point.
  - ③Waypoint — FROM waypoint → To waypoint
- ⑥Enter Target Point
  - ①Enter Target Number - Enter Target Number:
  - ③Enter Target Point — Enter Target Point
  - ⓪Set Pos Entry Method - Enter Position by: ①Lat/Long ②Rng/Brg ③LC LOPs ④Decca Lop ⑤Ship Pos ⑥+Cursor ⑦LA LOP
- ⑨Execute Self-Test
  - ①Memory & I/O Test
  - ②Keyboard Test — ①Main Unit Keyboard ②Remote Control
  - ③Color Test
  - ⓪Clear Memory
    - ①All Memories — [1] [8] [8] [ENT] — Power OFF
    - ②Specific Memory
      - ①Working Memory — [1] [8] [8] [ENT] — Power OFF/ON
      - ②File Memory — [1] [8] [8] [ENT] — Power OFF/ON
    - ③Option Program — [1] [8] [8] [ENT] — Power OFF/ON
    - ⑨GPS Data — [1] [8] [8] [ENT]
- ⓪Set System Settings
  - ①GPS Setup
    - ①Set GPS Settings
      - ②Time Difference — Enter Time Difference
      - ③Estimated Position — Enter Estimated Latitude:
      - ④Position Offset — Enter Lat/Long Offset:
      - ⑤Geodetic Datum — Set Geodetic Datum:
      - ⑥Antenna Height
    - ③Set Pos Fix Rules
      - ①Position Fix Mode — Select Position Fixing Mode:
      - ②DOP Limit — Enter DOP Limit
      - ③Min Elevation Angle — Enter Minimum Elevation Angle:
      - ④Pos Smooth Factor — Enter Position Smoothing Factor:
      - ⑤Spd Smooth Factor — Enter Speed Smoothing Factor:
    - ⑤Select Satellite
      - ①Disable Healthy Set — Enter satellite no. to be duabled:
      - ②Enable Unhealthy Set — Enter satellite no. to be enabled:
      - ⑨Restore Satellite — Enter satellite no. to auto:
    - ⑨Execute Cold Start
      - ①No specify satellite — ①Cold start : No ②Yes
      - ②Specify satellite — Enter satellite No.:
  - ⑧Tx/Rx Data Format
    - ①DATA 1 Port
      - ①FURUNO CIF
      - ②NMEA0182/0180
      - ③NMEA0183
      - ④User Format
        - ②Baud Rate
        - ③Data Bit — ①7 bits ②8 bits
        - ④Parity — ①None ②Even ③Odd
        - ⑤Stop Bit — ①2bit ②1bits
        - ⑦Handshake — ①NO ②YES
        - ⑧Rx Trial — ①NO ②YES
    - ②DATA 2 Port
      - ①FURUNO CIF
      - ②NMEA0183
      - ③Change Talker — Select Pseudo-talker?:
    - ③DATA 3/4 Port
      - ①FURUNO CIF
      - ②NMEA0183

Time Differences



Geodetic Chart Systems

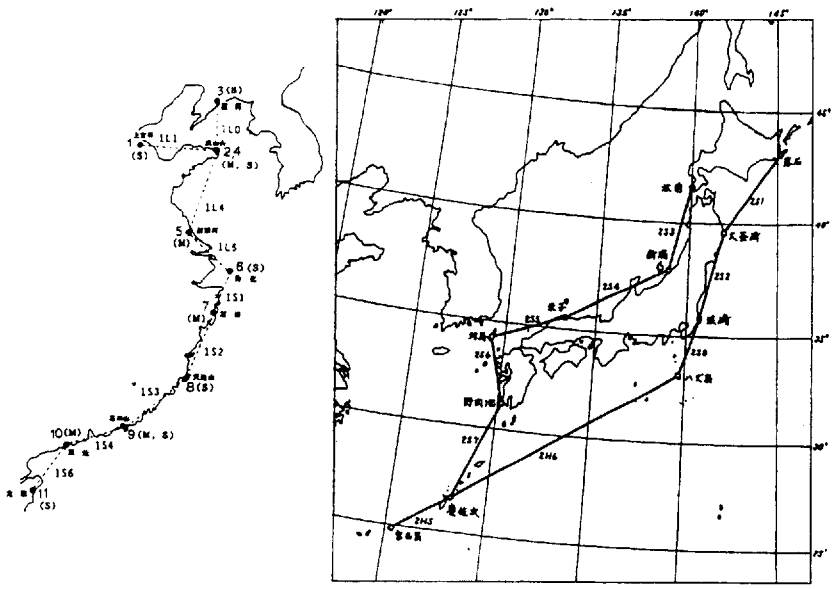
001 : WGS84	
002 : WGS72	
003 : TOKYO	: Mean Value (Japan, Korea, and Okinawa)
004 : NORTH AMERICAN 1927	: Mean Value (CONUS)
005 : EUROPEAN 1950	: Mean Value
006 : AUSTRALIAN GEODETIC 1984	: Australia and Tasmania Island
007 : ADINDAN	: Mean Value (Ethiopia and Sudan)
008	: Ethiopia
009	: Mali
010	: Senegal
011	: Sudan
012 : AFG	: Somalia
013 : AIN EL ABD 1970	: Bahrain Island
014 : ANNA 1 ASTRO 1965	: Cocos Island
015 : ARC 1950	: Mean Value
016 :	: Botswana
017 :	: Lesotho
018 :	: Malawi
019 :	: Swaziland
020 :	: Zaire
021 :	: Zambia
022 :	: Zimbabwe
023 : ARC 1960	: Mean Value (Kenya, Tanzania)
024 :	: Kenya
025 :	: Tanzania
026 : ASCENSION ISLAND 1958	: Ascension Island
027 : ASTRO BEACON "E"	: Iwo Jima Island
028 : ASTRO B4 SOR. ATOLL	: Tern Island
029 : ASTRO POS 71/4	: St. Helena Island
030 : ASTRONOMIC STATION 1952	: Marcus Island
031 : AUSTRALIAN GEODETIC 1966	: Australia and Tasmania Island
032 : BELLEVUE (IGN)	: Efate and Erromango Islands
033 : BERMUDA 1957	: Bermuda Islands
034 : BOGOTA OBSERVATORY	: Colombia
035 : CAMPO INCHAUSPE	: Argentina
036 : CANTON ISLAND 1966	: Phoenix Islands
037 : CAPE	: South Africa
038 : CAPE CANAVERAL	: Mean Value (Florida and Bahama Islands)
039 : CARTHAGE	: Tunisia
040 : CHATHAM 1971	: Chatham Island (New Zealand)
041 : CHUA ASTRO	: Paraguay
042 : CORREGO ALEGRE	: Brazil
043 : DJAKARTA (BATAVIA)	: Sumatra Island (Indonesia)
044 : DOS 1968	: Gizo Island (New Georgia Islands)
045 : EASTER ISLANDS 1967	: Easter Island
046 : EUROPEAN 1950 (Cont'd)	: Western Europe
047 :	: Cyprus
048 :	: Egypt
049 :	: England, Scotland, Channel, and Shetland Islands
050 :	: England, Ireland, Scotland, and Shetland Islands
051 :	: Greece
052 :	: Iran
053 :	: Italy・・Sardinia
054 :	: Italy・・Sicily
055 :	: Norway and Finland
056 :	: Portugal and Spain
057 : EUROPEAN 1979	: Mean Value
058 : GANDAJIKA BASE	: Republic of Maldives
059 : GEODETIC DATUM 1949	: New Zealand
060 : GUAM 1963	: Guam Island
061 : GUX 1 ASTRO	: Guadalcanal Island
062 : HJORSEY 1955	: Iceland
063 : HONG KONG 1963	: Hong kong
064 : INDIAN	: Thailand and Vietnam
065 :	: Bangladesh, India, and Nepal
066 : IRELAND 1965	: Ireland
067 : ISTS 073 ASTRO 1969	: Diego Garcia
068 : JHONSTON ISLAND 1961	: Jhonston Island
069 : KANDAWALA	: Sri Lanka
070 : KERGUELEN ISLAND	: Kerguelen Island
071 : KERTAU 1948	: West Malaysia and Singapore
072 : LA REUNION	: Mascarene Island
073 : L.C. 5 ASTRO	: Cayman Brac Island
074 : LIBERIA 1964	: Liberia
075 : LUZON	: Philippines (Excluding Mindanao Island)
076 :	: Mindanao Island
077 : MAHE 1971	: Mahe Island
078 : MARCO ASTRO	: Salvage Islands
079 : MASSAWA	: Eritrea (Ethiopia)
080 : MERCHICH	: Morocco
081 : MIDWAY ASTRO 1961	: Midway Island
082 : MINNA	: Nigeria
083 : NAHRWAN	: Masirah Island(Oman)
084 :	: United Arab Emirates
085 :	: Saudi Arabia
086 : NAMIBIA	: Namibia
087 : MAPARIMA, BWI	: Trinidad and Tobago
088 : NORTH AMERICAN 1927	: Western United States
089 :	: Eastern United States
090 :	: Alaska
091 :	: Bahamas (Excluding San Salvador Island)
092 :	: Bahamas・・San Salvador Island
093 :	: Canada (Including Newfoundland Island)
094 :	: Alberta and British Columbia
095 :	: East Canada
096 :	: Manitoba and Ontario
097 :	: Northwest Territories and Saskatchewan
098 :	: Yukon
099 :	: Canal Zone
100 :	: Caribbean
101 :	: Cenral America
102 :	: Cuba
103 :	: Greenland
104 :	: Mexico
105 : NORTH AMERICAN 1983	: Alaska
106 :	: Canada
107 :	: CONUS
108 :	: Mexico, Central America
109 : OBSERVATORIO 1966	: Corvo and Flores Islands (Azores)
110 : OLD EGYPTIAN 1930	: Egypt
111 : OLD HAWAIIAN	: Mean Value
112 :	: Hawaii
113 :	: Kauai
114 :	: Maui
115 :	: Oahu
116 : OMAN	: Oman
117 : ORDNANCE SURVEY OF GREAT BRITAIN 1936	: Mean Value
118 :	: England
119 :	: England, Isle of Man, and Wales
120 :	: Scotland and Shetland Islands
121 :	: Wales
122 : PICO DE LAS NIVIES	: Canary Islands
123 : PITCAIRN ASTRO 1967	: Pitcairn Island
124 : PROVISIONAL SOUTH CHILEAN 1963	: South Chile (near 53° S)
125 : PROVISIONAL SOUTH AMERICAN 1956	: Mean Value
126 :	: Bolivia
127 :	: Chile・・Northern Chile (near 19° S)
128 :	: Chile・・Southern Chile (near 43° S)
129 :	: Colombia
130 :	: Ecuador
131 :	: Guyana
132 :	: Peru
133 :	: Venezuela
134 : PUERTO RICO	: Puerto Rico and Virgin Islands
135 : QATAR NATIONAL	: Qatar
136 : QORNOQ	: South Greenland
137 : ROME 1940	: Sardinia Islands
138 : SANTA BRAZ	: Sao Maguel, Santa Maria Islands (Azores)
139 : SANTO (DOS)	: Espirito Santo Island
140 : SAPPER HILL 1943	: East Falkland Island
141 : SOUTH AMERICAN 1969	: Mean Value
142 :	: Argentina
143 :	: Bolivia
144 :	: Brazil
145 :	: Chile
146 :	: Colombia
147 :	: Ecuador
148 :	: Guyana
149 :	: Paraguay
150 :	: Peru
151 :	: Trinidad and Tobago
152 :	: Venezuela
153 : SOUTH ASIA	: Singapore
154 : SOUTHEAST BASE	: Porto Santo and Madeira Islands
155 : SOUTHWEST BASE	: Faial, Graciosa, Pico, Sao Jorge, and Terceira Islands
156 : TIMBALAI 1948	: Brunei and East Malaysia (Sarawak and Sadah)
157 : TOKYO	: Japan
158 :	: Korea
159 :	: Okinawa
160 : TRISTAN ASTRO 1968	: Tristan da Cunha
161 : VITI LEVU 1916	: Viti Levu Island (Fiji Islands)
162 : WAKE-ENIWETOK 1960	: Marshall Islands
163 : ZANDERIJ	: Suriname
164 : BUKIT RIMPAH	: Bangka and Belitung Islands (Indonesia)
165 : CAMP AREA ASTRO	: Camp Mcmurdo Area, Antarctica
166 : G. SEGARA	: Kalimantan Islands (Indonesia)
167 : HERAT NORTH	: Afghanistan
168 : HU-TZU-SHAN	: Taiwan
169 : TANANARIVE OBSERVATORY 1925	: Madagascar
170 : YACARE	: Uruguay

Loran C/A Chains

Loran C Chain

CHAIN	GRI	S1	S2	S3	S4	S5
CENTRAL PACIFIC	4990	11	29	– –	– –	– –
CANADIAN EAST COAST	5930	11	25	38	– –	– –
COMMANDO LION (Korea)	5970	11	31	42	– –	– –
CANADIAN WEST COAST	5990	11	27	41	– –	– –
SOUTH SAUDI ARABIA	7170	11	26	36	52	– –
LABRADOR SEA	7930	11	26	– –	– –	– –
EASTERN RUSSIA	7950	11	30	46	61	– –
GULF OF ALASKA	7960	11	26	– –	– –	– –
NORWEGIAN SEA	7970	11	26	46	60	– –
SOUTHEAST U.S.	7980	11	23	43	59	– –
MEDITERRANEAN SEA	7990	11	29	47	– –	– –
WESTERN RUSSIA	8000	10	25	50	65	– –
NOTRH CENTRAL U.S.	8290	11	27	42	– –	– –
NORTH SAUDI ARABIA	8990	11	25	40	56	69
GREAT LAKES	8970	11	28	44	– –	– –
SOUTH CENTRAL U.S.	9610	11	25	40	52	65
U.S. WEST COAST	9940	11	27	40	– –	– –
NORTHEAST U.S.	9960	11	25	39	54	– –
NORTHEAST PACIFIC	9970	11	30	55	81	– –
ICELANDIC	9980	11	30	– –	– –	– –
NORTH PACIFIC	9990	11	29	43	– –	– –

Loran A Chain



Decca Chains

No.	Chain	Chain Code	Area
01	SOUTH BALTIC	0A	Europe
02	VESTLANDET	0E	〃
03	SOUTH WEST BRITISH	1B	〃
04	NORTHUMBRIAN	2A	〃
05	HOLLAND	2E	〃
06	NORTH BRITISH	3B	〃
07	LOFOTEN	3E	〃
08		3E	〃
09	NORTH BALTIC	4B	〃
10	NORTH WEST	4C	〃
11	TRONDELAG	4E	〃
12	ENGLISH	5B	〃
13	NORTH BOTHNIAN	5F	〃
14	SOUTHERN SPANISH	6A	〃
15	NORTH SCOTTISH	6C	〃
16	GULF OF FINLAND	6E	〃
17	DANISH	7B	〃
18	IRISH	7D	〃
19	FINNMARK	7E	〃
20	FRENCH	8B	〃
21	SOUTH BOTHNIAN	8C	〃
22	HEBRIDEAN	8E	〃
23	FRISIAN ISLAMDS	9B	〃
24	HELGELAND	9E	〃
25	SKAGERRAK	10B	〃
26	NORTH PERSIAN GULF	5C	Persian Gulf & India
27	SOUTH PERSIAN GULF	1C	〃
28	BOMBAY	7B	〃
29	CALCUTTA	8B	〃
30	BANGLADESH	6C	〃
31	SALIYAH	2F	〃
32	HOKKAIDO	9C	Japan
33	TOHOKU	6C	〃

No.	Chain	Chain Code	Area
34	KANTO	8C	Japan
35	SHIKOKU	4C	〃
36	HOKURIKU	2C	〃
37	KITA-KYUSHU	7C	〃
38	NAMAQUALAND	4A	Southrn Africa
39	CAPE	6A	〃
40	EASTERN PROVINCE	8A	〃
41	SOUTH WEST AFRICA	9C	〃
42	NATAL	10C	〃
43	DAMPIER	8E	Australia
44	PORT HEADLAND	4A	〃
45	ANTICOSTI	9C	North America
46	EAST NEWFOUNDLAND	2C	〃
47	CABOT STRAIT	6B	〃
48	NOVA SCOTIA	7C	〃

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